

Atlas of Microorganisms

The Penicillia

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微生物圖譜

The Penicillia

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PREFACE

The recent advancement in fundamental and applied microbiology is quite remarkable. It is also true the connection that microorganisms have with our lives and daily living is closer and closer. Today, as a part of biology, microbiology is just as important as zoology and botany. As a result, it can be said that there is a tendency where the knowledge of the individual species and strains of microorganisms will be gradually as well known as other living things.

It is not only of academic interest to classify and identify strains of microorganisms, but it does constitute an important foundation in the theoretical as well as the applied study of microbiology. Especially, after World War II, molds and bacteria have come to play important roles medically as well as industrially, in the output of industrial products, drugs, pharmaceuticals, and food-stuffs. Isolation and identification of microorganisms have become prerequisites for utilizing them for industrial use.

Although numerous research works have been published on the classification and identification of microorganisms in the past years, a general account of the subject, which can be easily understood and used by teachers and students of microbiology, is lacking. Knowledge of microbial genetics and mutation has tremendously advanced in recent years. In addition, we now have the powerful new tools,—the electron microscope and colored photography, for studying morphology. Therefore, publication of new books or articles on the morphology of microorganisms is very desirable.

This atlas, with the foregoing aims, has utilized the latest techniques and describes the morphology of microorganisms, emphasizing the facility it offers not only to professionals but also to other specialists and scholars.

This first volume is by Dr. Shigeo Abe on genus *Penicillium*. This genus is one of the most widely distributed mold types in nature. Its utilization and effect are deeply related with human life.

The author has already published his ten year study of the classification of *penicillium* species. However, this book has been written with a view to diffuse widely his knowledge on the mold *penicillia*, based on his own studies, but utilizing new techniques.

The photographs are printed by the Kanehara Shuppan Co., Ltd. whose techniques are widely known.

It is believed that the book will contribute greatly to scholars of botany, microbiology, and food technology.

University of Tokyo
Bunkyo-ku, Tokyo
August, 1957

Kin ichiro Sakaguchi,

微生物圖譜

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最近の微生物に関する理論及び応用の学問の進歩はまことに口覚しく微生物と我等の日常生活との結びつきの密接になって来たことも亦昔日の比ではない。今や微生物学は生物学上に於て動物学及び植物学と相並んで重要な地位を占めるに至り、従て微生物の種類に関する知識の如きも生物学の他の両分野に属する生物と等しく一般に広く普及されねばならない氣運に立ち至っているものといわねばならない。

各種の微生物を分類し同定することはそれ自体学問上興味深い仕事であるばかりでなくそれは實に微生物学の理論及び応用の重要な基礎をなすものである。ことに応用の面に於ては古くからの微生物の医学上及び産業上に於ける重要性に加うるに第2次大戰後各種工業製品、医薬品、食飼料の生産等えの新たな応用の面が広く開かれて以来個々の微生物の種又は菌株の検索同定も著しく重要性を加え、微生物分類学の街頭進出の觀を呈するに至っているのである。

翻つて考うるに微生物の同定、分類に関する研究の発表は年々夥しいものがあるにも拘らずその各部門に於ける総合的なしかも他の専門に属する研究者又は一般の教育者にも容易に理解し利用し得るような形の著述に至っては必ずしも多いとはいわれない。特に最近の電子顕微鏡写真と着色写真印刷技術との進歩は斯くの如き目的に向かつての絶大な武器ともいふべく微生物の遺伝変異の研究の進歩により旧來の分類に対して書き換え式的の変更を必要とする点に於ても新たな著述の強く要望される所以である。

本書は上に述べるような目的を以て最新の技術を利用して特に微生物の形態による検索同定に重点を置いて編述され専門外の研究者、技術者にも入りやすからしめることを目的としたものである。

本書の第1集は阿部重雄君によるヘニノリウム属に関するものである。この属は糸状菌のうちでも自然界に最も広く分布するものの一つであつて利用、防除の両面に於て人々に深い關係を有するものである。

本属の分類に関する著者の十余年に亘る研究は別に発表されて世界の斯学会に重視される所であるが本集はその基礎の上に立って前記のような新たな視野から新たな目的に依るべく最新の技術を駆使して編述されたものである。金原出版の刊行に関する定評ある技術と相俟つて世の研究者を益することの多大なるべきを信じて疑わないものである。

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Introduction

The molds of the genus *Penicillium* have closely participated in our daily life, as can be illustrated with *P. camemberti* used in the production of Camembert Cheese, *P. roqueforti* in Roquefort Cheese, or *Citromyces* used in citric acid production, or *P. digitatum* which spoils lemon and orange, *P. expansum* which is responsible for an apple disease, *P. islandicum* isolated from diseased rice; and others which contaminate to foods, leathers, clothes, etc

In 1929, Dr A Fleming of England observed that a *Penicillium*, which grew accidentally on the culture plate of *Staphylococcus aureus* caused the lysis of its surrounding cocci cells. Thus he discovered for the first time an antibiotic (namely, Penicillin) produced by the pure culture of the molds

Since that time, *Penicillia* have been received keen interests and it has been disclosed that they produce various kinds of antibiotics and large amounts of various useful metabolic products, as will be described later. The first adequate illustration of a mold unquestionably representing a *Penicillium* was given in the 1803 publication of Bulliard and Ventenat, in which *Mucor penicillatus* represented the broom or brush-like forms. The generic name, *Penicillium*, applied to fungi, first appeared in Link's "Observation" (1803), in which he described very briefly the genus and three species. *Penicillium glaucum*, *P. candidum*, and *P. expansum*

Wehmer (1893) used the generic name *Citromyces*, and subgeneric *Verticillatae*, and in 1901 proposed the name *Microaspergillus*. He also reported on the physiological and biochemical activities of the *Penicillia* in 1906

Dierckx (1901) described as new 25 species, and proposed a subgenus *Aspergilloides*, for the monoverticillate form

Thom (1906) published "Fungi in Cheese Ripening", and Bainier (1907) proposed the genera *Paecilomyces* and *Scopulariopsis*, Brefeld (1908) proposed the name *Lysipenicillium* and published the life history of *Penicillium glaucum* (1874); Westling (1909) proposed the generic name *Byssochlamys*, he also classified *Eupenicillium* on the basis of the size of conidia and described the *Aspergilloides* in 1911

Sopp (1912) published many figures covering some sixty species of *Penicillium* and proposed the new genera *Acaulium*, *Aspergillopsis*, *Corollium*, *Dactylomyces* and *Styanus*. He classified these five on the basis of conidial color and described ten strains of *Aspergilloides*

Biourge (1923) gave a brief Latin diagnosis for some 125 species, and in his Monograph he classified the *Penicillia* on the basis of the character of conidiophores, penicillus, conidia, color and color change, etc., and proposed the subgenus *Monoverticillium*. In this Monograph, he divided the *Penicillia* into the two subgenera, *Eupenicillium* and *Monoverticillium* (*Aspergilloides* Dierckx 1901), and divided the former into two sections, *Bulliardium* or *Asymmetrica* and *Biverticillium* Dierckx

(1900); he further divided the first section into six sub-sections, and the second into four series. Zaleski (1927) described 35 new species and one new variety of *Penicillium* from the forest soils of Poland, and he accepted the classification given in Biourge's Monograph, fitting his species into his scheme insofar as possible.

Thom (1930), in his comprehensive Monograph, brought together all of the material on the taxonomy of cultures grown in the laboratory under uniform conditions and emphasized the importance of observations made on growing colonies and developing conidial structure. In this work the genus *Penicillium* was divided into four groups, Monoverticillata, Asymmetrica, Biverticillata-Symmetrica, and Polyverticillata-Symmetrica; *Pacilomyces*, *Ghocladium* and *Scopulariopsis* were separated from *Penicillium* but were treated as related genera. Thom described 678 species; the Monoverticillata groups was divided into Monoverticillata-stricta and Monoverticillata-ramigena and the former was divided into four sub-section; the Asymmetrica group was divided into six sections, the Velutina into six sub-sections, and the Fasciculata into six sub-sections, the Biverticillata Symmetrica groups was divided into four sections, and the Luteo-viride into two series. In the classification given by Raper, Thom and Fennell in their work, "A Manual of the Penicillia" (1949), all the described species were readjusted and the species named after 1930 were added; a total of 137 species was recognized.

The primary basis of separation within the genus *Penicillium* rests upon the pattern and complexity of the conidial structure, or penicillus. Raper, Thom and Fennell accepted the divisions used in Thom's classification, and his four major sections.

The second basis of separation is whether or not perithecia or sclerotia are produced. The third basis of separation is that of colony characteristics. The basis of separation within the five sub-sections in the Asymmetrica, rests primarily on the texture and pattern of the surface, or the nature of aerial growth. Sub-sections and series are established upon the following bases: colonies are regarded as velvety, floccose or lanose, funiculose, fasciculate or coremiform in appearance. The additional bases of separation are the pigmentation of conidia and the colony reverse, the rate of growth on common laboratory media, and the pattern of mature conidial chains. Here again, separation may depend upon the detailed structure of the penicillus, the pattern or character of the sterigmata, the form and markings of the conidiophores, or the shape and dimensions of the conidia. By the combination of the criteria described above, forty one series were classified and the major sub-sections were determined in the Asymmetrica. In the classification given by Abe (1954), a total of 116 species and varieties are classified. In earlier classifications, morphological characters form the chief basis for division but in his report, by the combination of morphological and biochemical characters, a new classification of the genus *Penicillium* was made.

(1) ANTIBIOTICS OF *PENICILLIUM*

Name	Producing Species
1. <i>Penicillium</i>	<i>P. notatum</i> , <i>P. chrysogenum</i>

2 Albidin	<i>P. albidum.</i>
3 Citrine	<i>P. citrinum,</i>
4 Citromycetin	<i>P. frequentans</i>
5 Clavacin (Clavatin, Claviformin, Expansin, Patulin)	<i>P. patulum, P. leucopus, P. claviforme</i>
6 Corylophylin	<i>P. corylophyllum.</i>
7 Cyclopaldic acid	<i>P. cyclopium</i>
8 Frequentin	<i>P. frequentans.</i>
9 Gentisyl alcohol	<i>P. patulum, P. divergens, P. urticae</i>
10 Gladiolic acid	<i>P. gladioli</i>
11 Griseofulvin	<i>P. griseofulvum</i>
12 Herquein	<i>P. herquet.</i>
13 Mycelianamide	<i>P. griseofulvum.</i>
14. Mycophenolic acid	<i>P. brevi-compactum, P. stoloniferum</i>
15 Penatin	<i>P. notatum, P. reticulosum, P. corylophyllum.</i>
16 Penicidin	<i>Penicillium, sp.</i>
17 Penicillic acid	<i>P. puberulum, and others</i>
18 Helenin	<i>P. funiculosum</i>
19 Phenicin or Phoenicin	<i>P. phoeniceum, P. rubrum</i>
20 Puberulic acid, Puberulonic acid	<i>P. puberulum, P. aurantio-virens, P. cyclopium, P. viridicatum, P. johannioli</i>
21 Spinulosin	<i>P. spinulosum, P. cinarensens</i>
22 Tardin	<i>P. tardum.</i>
23 Trichocidin	<i>P. notatum</i>
24 Xanthocillin	<i>P. notatum</i>

(2) PRODUCTS OF *PENICILLIUM*

Name	Producing Species
Citric acid	<i>P. frequentans, Citromyces glaber, Citromyces pfefferianus, P. luteum, P. citrinum, P. glaucum, P. arecharium</i>
Gluconic acid	<i>P. chrysogenum, P. luteum purpurogenum</i>
Fumaric acid	<i>P. griseofulvum</i>
Fumary glycidic acid	<i>P. viniferum</i>
Iso-citric acid	<i>P. purpurogenum Stoll var. rubri-sclerotium, and Others.</i>
Spiculisporic acid	<i>P. spiculisporum, P. crateriform, P. minutum,</i>

γ -ketopentadecic acid	<i>P. spiculisporum.</i>
Minio-luteic acid.	<i>P. mino-luteum.</i>
Folic acid	<i>P. membranacefaciens</i>
Ergosterol.	<i>P. chrysogenum</i>
Vitamin B ₁ , B ₂ , B ₁₂	<i>Penicillium, sp.</i>
Amylase, Protease	<i>Penicillium.</i>
Pectin	<i>P. chrysogenum, P. ehrlichii, P. adametz-</i> <i>ioides.</i>
i-erythrit	<i>P. brevis-compactum, P. cyclopium</i>
Pentosan	<i>Penicillium, sp</i>
Mycodextran	<i>P. expansum,</i>
Sclerotiose	<i>P. sclerotiorum.</i>
Rugulose	<i>P. rugulosum</i>
Galactocarolose	<i>P. charlesii.</i>
Luteic acid	<i>P. luteum, P. islandicum.</i>
Varianose	<i>P. varians.</i>
Capreolinose	<i>P. capreolinum</i>
Islanditoxin	<i>P. islandicum.</i>
Fungisporin	<i>Penicillium, sp</i>
Dihydrogladiolic acid	<i>P. gladioli.</i>
6-hydroxy-methyl benzoic acid	<i>P. griseo-fulvum, P. flexuosum</i>
Mycelianamid	<i>P. griseo-fulvum</i>
Gentisyl alcohol	<i>P. patulum, P. urticae</i>
Gentisic acid	<i>P. griseo-fulvum</i>
3-5-dihydroxylphthalic acid	<i>P. brevis-compactum</i>
Mycophenolic acid	<i>P. stoloniferum, P. brevis compactum</i>
Cyclopaldic acid	<i>P. cyclopium</i>
Purpurogenone	<i>P. purpurogenum</i>
Citrinin	<i>P. citrinum</i>
Citromycetin	<i>P. frequentans.</i>
Spinulosin	<i>P. spinulosum, P. cerascens</i>
Phoenicin	<i>P. phoeniceum, P. rubrum</i>
Herqueinone	<i>P. herqueti</i>
Nalgiovensin	<i>P. nalgiovensis</i>
Skyrin	<i>P. islandicum, P. wortmanni</i>
Rubroskyrin Iridoskyrin Flavoskyrin Erythroskyrin	<i>P. islandicum</i>
Rugulosin	<i>P. rugulosum, P. wortmanni</i>
Penicillipsin	<i>P. clavisaeformis</i>

Pinelin	<i>P. amarum</i>
Stipitatic acid	<i>P. stipitum</i>
Puberulic acid, Puberulonic acid	<i>P. puberulum, P. aurantio-virens</i>
Terrein	<i>P. raistrickii</i>
Dehydro carolic acid	<i>P. cinerascens</i>
Terrestrial acid	<i>P. terrestre,</i>
Penicillic acid	<i>P. puberulum, P. cyclopium</i>
Viridicatin and cyclopenin	<i>P. cyclopium</i>
Geodin	<i>P. estirogenum</i>
Griseofulvin	<i>P. griseofulvum, P. janczewskii</i>
Nalgiolaxin	<i>P. nalgioensis</i>
Sclerotiorine	<i>P. sclerotiorum, P. multicolor</i>

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(4) LIST OF ABBREVIATIONS INDICATING THE SOURCE OF CULTURES

ATCC American Type Culture Collection, Washington, D C.

CBS Centraalbureau voor Schimmelcultures, Baarn.

CMI The Commonwealth Mycological Institute Kew, Surrey

IAM Institute for Applied Microbiology, University of Tokyo

IFO Institute for Fermentation, Osaka.

Kyowa Tokyo Research Laboratory, Kyowa Fermentation Industry Co, Ltd, Tokyo

NCTC National Collection of Type Cultures, London

NI Nagao Institute, Tokyo

NRRL Northern Utilization Research Branche U S Dept of Agriculture

緒 論

アオカビはカマンベールチーズ製造に用いられる *P. camemberti*, ロックフェールチーズの *P. roqueforti*, スウェーデンで作る *Citromyces*, レモン、サレンに病害をなせる *P. digitatum*, リンゴ病害菌の *P. expansum*, 新島木の *P. islandicum* 食品、皮革、衣服等に附着する各種のアオカビ等は我々の日常生活に關係が深い。

1929年英國のクレイブ博士が *Staphylococcus aureus* の平板培養上に繁殖したアオカビかその菌叢の *S. aureus* を殺滅して菌の細胞膜を壊し、このアオカビを純粋培養として抗生物質（ペニシリン）を生じし得る事を見出し、以来アオカビは注目され、後述せる如き各種抗生物質を生じし、又色々の代謝物を作る事が明らかになり、アオカビ（ペニシリウム）についての記述は1809年 Bulliard & Ventenat が、けかび（*Mucor*）の菌叢で皮糸カビと記述であると記載したのに始まる。ペニシリウム（アオカビ）属の名前を用い

たのは、*P. glaucum* *P. candidum*, *P. expansum*, を記載した 1809 年発行の Link の “*Observation*” が最初である。

1893 年 Wehmer は *Citromyces* (現在の *Monoverticillata*) 属名及び *Verticillates* の亜属名を用い、又 1901 年にて *Microaspergillus* 属名を提唱した。次いで 1906 年 ヘニリウムの生化学的機作について報告している。1901 年 Dierckx は 25 の新種を記載し、単輪生状ヘニラスを有する *Aspergilloides* 亜属を発表した。

1906 年 Thom は “チーズの成熟に於けるカビ” を出版。1907 年 Bainier は現在ヘニリウム類様菌となっている *Paecilomyces* 及び *Scopulariopsis* 属を設定。1908 年 Brefeld は *Lysipencilium* 属を提唱し、又 1874 年 *P. glaucum* の生活史を発表した。

1909 年 Westling は *Byssoschlamys* 属を設定、1911 年には分生胞子の大きさにて *Eupencilium* を分類し又 *Aspergilloides* についても報告している。

1912 年 Sopp はヘニリウムの 60 種について図解を行い、又分生胞子の呈色に基づいて *Acaulium*, *Aspergillopsis*, *Corollium*, *Dactylomyces*, *Styanus* 各属の設定を行い *Aspergilloides* の 10 種について記載した。

1923 年 Biourage は 125 種を分生胞子柄、ヘニラス、分生胞子、呈色並びに色の変化等の特性にて分類を行い、又 *Monoverticillium* 亜属を設置した。即ちヘニリウム属を *Eupencilium* と *Monoverticillium* (Dierckx, 1901 年の *Aspergilloides*) の亜属に大別し、前亜属を *Bulliardium* 或は *Asymmetrica* と *Biverticillium* Dierckx (1900) の二区に分け、更に前区を 6 亜区に分別した。又後亜属は四つの (series) 組に分けた。

1927 年 Zaleski はホルランドの森林土壌より分離したヘニリウムの 35 新種と一変種を記載し Biourage の分類方式を受け入れた。

1930 年 Thom はポールの条件下で培養を行い、集落の発育、分生胞子構成体の発達を順次観察する重要性を強調し、ヘニリウム属を *Monoverticillata*, *Asymmetrica*, *Biverticillata* *Symmetrica*, *Polyverticillata*, の 4 群に大別、*Paecilomyces*, *Gliocladium*, *Scopulariopsis* はヘニリウム属の類縁属として分離した。678 種を記載し、単輪生状 (*Monoverticillata*) 群は純単輪生 (*Monoverticillata strict*) と分枝単輪生 (*Monoverticillata-Ramigena*) の二区に分別し、前者は更に四亜区に別けた。不整齊双輪生状群 (*Asymmetrica*) は 6 区に分け、ピロート状区 (*Velutina*) は 6 亜区に、束状区 (*Fasciculata*) は 6 亜区に分別した。整齊双輪生状群 (*Biverticillata Symmetrica*) は四区に分け、黄緑性区 (*Luteo-viride*) は更に 2 組 (series) に分別した。

1949 年 Raper, Thom, Fennell 等は “*A Manual of the Penicillia*” を発行し、1930 年 Thom 報告以後の新種を加えて整理を行い、137 種を確認分類方式を一新した。

ヘニリウム属の分類第一因子は分生胞子構成体、即ちヘニラスの様相又は複雑性に基き Thom の分類方式を踏襲して 4 区に大別した。第二因子として接子器又は菌核形成の有無、第三因子として集落の諸特性を用いた。不整齊双輪生区 (*Asymmetrica*) の分別は集落の菌叢、表面の様相、或は気生発育の性質に基き、亜区及び組 (series) の分別には次の諸因子に基づいた。即ちピロート状、綿毛状又は羊毛状、繩状、束状或は結束束状か等の菌叢特性、分生胞子の色、集落表面の色、各培養基に於ける発育程度、成熟分生胞子の連鎖の形状、更にヘニラス微細構成様相、接子の様相及び特性、分生胞子柄の形及び横壁の粗細度合、分生胞子の形及び大きさ。之等の基準を組合せて 41 組 (series) に分類、不整齊輪生区 (*Asymmetrica*) には 5 亜区を設定した。

1956 年阿部は 116 の種又は変種の分類を行い、本来は主に形態的特性にて分別を行っているが、更に之れに生化学的的特徴を加えて後述の新分類方式を確立した。

ヘニリウムの有る各抗生物質及び代謝物、及び参考文献、菌株保存機関については英文を読まれたい。

I. Culture Media

A. Media used in earlier studies

- 1 Raulin's solution
- 2 Bean Agar and Potato agar
- 3 Potato-Dextrose agar
- 4 Licorice sticks.
- 5 Prune Gelatine
6. Wort or Beer wort

B Media used in the present study.

1) Czapek agar (Distilled water)	1,000 cc.
NaNO ₃	30 grams
K ₂ HPO ₄	10 gram
MgSO ₄ ·7H ₂ O	05 gram
KCl	05 gram
FeSO ₄ ·7H ₂ O	001 gram
Sucrose (Cube or other good commercial grade)	300 grams
Agar	15 to 20 grams

(The pH is nearly neutral and is not adjusted)

2) Modified Czapek agar (for isolation)

Distilled water	1,000 cc.
NaNO ₃	20 grams
K ₂ HPO ₄	10 gram
MgSO ₄ ·7H ₂ O	05 gram
KCl	05 gram
FeSO ₄ ·7H ₂ O	001 gram
Glucose	100 grams
Agar	300 grams

(Adjust pH 4.3 to 4.4 with 0.2 N HCl)

3) Steep agar Czapek agar plus the addition of 10 gms concentrated corn steep liquor.

The pH is adjusted to 7.0 with normal NaOH before sterilization.

4) Malt extract agar	Malt extract (Difco)	200 grams
	Dextrose	200 grams
	Peptone	10 gram
	Agar	250 grams
	Distilled water	1.0 liter

The agar is melted in water in the autoclave prior to the addition of the nutrients. The pH is approximately 4.7 and is not adjusted. Using 25 percent agar, the medium should set firm

when sterilized in the usual manner. The other methods, 1 kg. saccharified malt is dissolved in 5 liters distilled water at about 65°C, filtered, made up to 10 Ballg solution, and adjusted to pH 4.7; 20 to 25 grams agar per liter is added and the medium is sterilized

- 5) Koji extract agar: 1 kg. Koji is saccharified in about 5 liter distilled water at about 60°C, filtered, made up to 10 Ballg. solution, and adjusted to pH 6.0; 20 gms agar per liter is added and the medium is sterilized
- 6) Corn meal agar: 50 gms white corn meal (contained in cloth bag) is boiled in one liter distilled water for one half hour, filtered, and made up to original volume; 20 gms agar is added and the medium is sterilized
- 7) Hay infusion agar: 50 gms decomposing hay is autoclaved in one liter of distilled water for 30 minutes, and filtered. Two gms. K_2HPO_4 and 20 gms. agar per liter of infusion filtrate is added, pH adjusted to 6.2 with HCl and the medium is sterilized.
- 8) 20 per cent sucrose Czapek: Similar to 1, except 20 per cent sucrose instead of 3 per cent is added. The pH is nearly neutral and is not adjusted
- 9) Sakaguchi and Wang agar: Similar to 1, except 15 gms $NaNO_3$ per liter instead of 30 gms $NaNO_3$ is added. The pH is adjusted to 7.0 with NaOH.

II. Types of cultures

1) Test tube cultures

The preparation of test tube cultures is practically essential in the handling of a *Penicillium*. Inoculation of such tubes is usually made by wire or loop from a selected mass of mycelium or spores. In studying specimens as received, or as newly isolated, transfers to test tubes should be made before any other studies are begun.

Such tube cultures, however, cannot be recommended for observation, (1) the colony area is generally too small and too confined for the development of wholly characteristic cultural patterns; (2) the culture cannot be viewed directly with the low powers of the compound microscope, and (3) portions of the growing colony cannot be carefully selected and easily removed for the preparation of suitable microscopic mounts. But, these cultures are useful to have knowledge of generally characteristic cultural patterns.

2) Plate cultures

- a) Spot cultures: The type of culture most commonly employed is based upon the spot inoculation of agar plates with masses of conidia or bits of mycelium from a selected area in the parent culture. Where it is desired to establish a specific number of colonies in particular position within the culture plate, it is advisable to suspend the conidia in sterile water or better still in melted agar, at about 45°C. and then transfer small amounts of the gelled spore suspension to the fresh culture.

Such transfers can be made by means of a conventional wire needle or loop. Single, two or

more colonies are desirable for purposes of observation and these can be established in the same manner

- b) **Slanted plates** By using slanted plates one can in a single culture, study the effects of varying depths of agar as this influences the rate of evaporation, the concentration of nutrients, and other factors which markedly effect the rate and pattern of colony growth. And this technique is convenient in selections screening of many strains by general characteristics
- c) **Dilution cultures** Dilution cultures are extremely useful in certain types of work, particularly the isolation of strains from soil or other natural substrata. They are equally useful for separating two or more *Penicilli* which may be growing in close association as a result of contamination. The first of these consists of suspending the inoculum or sample of natural material in a sterile water blank and diluting this progressively by the serial transfer of aliquots of specified amount, usually 1 cc., from one to another in a series of similar water blanks. Samples are removed from the dilutions selected as probably most suitable and placed in sterile petri dishes followed by the addition of a melted agar medium at about 45 °C. In cultures developing from such dilution plates it is desirable to have not less than 3 colonies or more than 10 to 12.

The second method of preparing dilution cultures consists of adding the inoculum or sample to a tube of melted agar and carefully mixing the added material throughout the agar mass. By means of a pipette or loop, a small amount of this suspension is then transferred to a second agar tube, a portion of the second to the third, etc., to secure the desired dilutions of the original sample. The melted agar containing such dilutions is then poured into petri dishes and allowed to solidify. The second method is often equally as satisfactory as the first.

- d) **Streak cultures.** For isolating *Penicillia* from natural materials, or for separating two or more strains growing together in culture, streak plates are often quite satisfactory and are more easily prepared than either of the above types of dilution plates. In the preparation of streak cultures care should be taken in selecting the inoculum so that a minimum of extraneous material is included and the streaking process should be continued through a distance sufficient to allow the development of separate colonies.

Streak cultures have another important application in the study of natural variation within an unstable strain of *Penicillium*.

- e) **Single Spore Cultures** In the dilution method as described above, such a percentage actually develops from single cells can be determined by comparing the number of developing colonies with the haemocytometer count of conidia present in the original suspension. Using such cultures, however, it is impossible to know whether any particular colony developed from a single conidium or from two or more adherent cells.

The investigator needs to know with certainty that every colony had developed from a single spore, it is necessary to employ some type of micro-manipulator and cutting disk method. And, the other method is as follows. Conidia of a selected culture are thoroughly dispersed in sterile

when sterilized in the usual manner. The other methods, 1 kg. saccharified malt is dissolved in 5 liters distilled water at about 65°C, filtered, made up to 10 Ballg solution, and adjusted to pH 4.7; 20 to 25 grams agar per liter is added and the medium is sterilized.

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- 7) Hay infusion agar: 50 gms. decomposing hay is autoclaved in one liter of distilled water for 30 minutes, and filtered. Two gms. K_2HPO_4 and 20 gms. agar per liter of infusion filtrate is added, pH adjusted to 6.2 with HCl and the medium is sterilized.
- 8) 20 per cent sucrose Czapek Similar to 1, except 20 per cent sucrose instead of 3 per cent is added. The pH is nearly neutral and is not adjusted.
- 9) Sakaguchi and Wang agar. Similar to 1, except 1.5 gms $NaNO_3$ per liter instead of 3.0 gms $NaNO_3$ is added. The pH is adjusted to 7.0 with NaOH

II. Types of cultures

1) Test tube cultures

The preparation of test tube cultures is practically essential in the handling of a *Penicillium*. Inoculation of such tubes is usually made by wire or loop from a selected mass of mycelium or spores. In studying specimens as received, or as newly isolated, transfers to test tubes should be made before any other studies are begun.

Such tube cultures, however, cannot be recommended for observation; (1) the colony area is generally too small and too confined for the development of wholly characteristic cultural patterns; (2) the culture cannot be viewed directly with the low powers of the compound microscope; and (3) portions of the growing colony cannot be carefully selected and easily removed for the preparation of suitable microscopic mounts. But, these cultures are useful to have knowledge of generally characteristic cultural patterns.

2) Plate cultures

a. Spot cultures. The type of culture most commonly employed is based upon the spot inoculation of agar plates with masses of conidia or bits of mycelium from a selected area in the parent culture. Where it is desired to establish a specific number of colonies in particular position within the culture plate, it is advisable to suspend the conidia in sterilized water or better still in melted agar, at about 45°C, and then transfer small amounts of the gelled spore suspension to the fresh culture.

Such transfers can be made by means of a conventional wire needle or loop. Single, two or

more colonies are desirable for purposes of observation and these can be established in the same manner.

- b) **Slanted plates:** By using slanted plates one can in a single culture, study the effects of varying depths of agar as this influences the rate of evaporation, the concentration of nutrients, and other factors which markedly effect the rate and pattern of colony growth. And this technique is convenient in selections screening of many strains by general characteristics.
- c) **Dilution cultures:** Dilution cultures are extremely useful in certain types of work, particularly the isolation of strains from soil or other natural substrata. They are equally useful for separating two or more *Penicilli* which may be growing in close association as a result of contamination. The first of these consists of suspending the inoculum or sample of natural material in a sterile water blank and diluting this progressively by the serial transfer of aliquots of specified amount, usually 1 cc., from one to another in a series of similar water blanks. Samples are removed from the dilutions selected as probably most suitable and placed in sterile petri dishes followed by the addition of a melted agar medium at about 45 °C. In cultures developing from such dilution plates it is desirable to have not less than 3 colonies or more than 10 to 12.

The second method of preparing dilution cultures consists of adding the inoculum or sample to a tube of melted agar and carefully mixing the added material throughout the agar mass. By means of a pipette or loop, a small amount of this suspension is then transferred to a second agar tube a portion of the second to the third, etc., to secure the desired dilutions of the original sample. The melted agar containing such dilutions is then poured into petri dishes and allowed to solidify. The second method is often equally as satisfactory as the first.

- d) **Streak cultures** For isolating *Penicillia* from natural materials, or for separating two or more strains growing together in culture, streak plates are often quite satisfactory and are more easily prepared than either of the above types of dilution plates. In the preparation of streak cultures care should be taken in selecting the inoculum so that a minimum of extraneous material is included and the streaking process should be continued through a distance sufficient to allow the development of separate colonies.

Streak cultures have another important application in the study of natural variation within an unstable strain of *Penicillium*.

- e) **Single Spore Cultures** In the dilution method as described above, such a percentage actually develops from single cells can be determined by comparing the number of developing colonies with the haemocytometer count of conidia present in the original suspension. Using such cultures, however, it is impossible to know whether any particular colony developed from a single conidium or from two or more adherent cells.

The investigator needs to know with certainty that every colony had developed from a single spore, it is necessary to employ some type of micro-manipulator and cutting disk method. And the other method is as follows. Conidia of a selected culture are thoroughly dispersed in sterile

water containing a detergent, sodium lauryl sulfonate, in a concentration of 1:10,000. Appropriate dilutions of this suspension are then spread evenly over the surface of a carefully filtered nutrient agar. The plates are incubated at a favorable temperature over night and the conidia allowed to germinate. The plates are examined on the following day with a wide field binocular microscope and the positions of isolated germinating cells are marked. These are then carefully checked with a compound microscope using an 8 mm. objective to insure that no ungerminated spores are present in the immediate area of the cells selected for isolation. By means of a micro-scalpel fashioned from thin platinum-iridium wire, a minute block of agar surrounding the selected spore is removed under the low power binocular and transferred to a fresh agar plate. The small agar block is then re-examined with the 8 mm objective to insure that the selected spore has been transplanted.

III. Isolation, screening tests and Spot culture

For the isolation of *Penicillia* from natural materials, dilution and streak cultures are used. Usually spores are transferred to Czapek agar slants from spot colonies in petri dishes grown at 25° or 30°C for 4 to 5 days; the slants are then incubated at 25°C for 5 to 7 days. Similarly strains are selected and grouped from numerous strains of newly isolated on the basis of colony characters. Continuous monospore culture is then carried on for the all strains, and from these characteristic strains are selected by rigid observation of colony characteristics.

Normal strains, which are found to be the same as when isolated from natural sources by monospore cultures (dilution culture), are used for diagnosis. The diagnostic technique usually employed is spot inoculation of agar plates with masses of conidia from a selected areas of the normal strains grown on Czapek agar slants which have been incubated at 25°C for 5 to 7 days. Then, the characteristics as described after are diagnosed from one day to another in cultures, and the correct determination of species be achieved. We usually employed three identical plates for each test, with one colony per plate, and these were incubated at 5, 15, 25, 30, 37°C, on various media as described above. But, Raper, Thom and Fennell usually employed plates inoculated with three colonies to be generally satisfactory and to offer a degree of uniformity, useful for comparative purposes.

IV. Observation and description

(1) Colony characteristics

- 1 Rate of growth. Colony diameter after 5 days, 10 to 12 days and 20 to 22 days at various temperatures
- 2 Colony depth. A film of colony and substratum is cut out of the colony center, mounted on a glass slide, and the colony depth is measured at the margins, in the subcentral areas, and in the central area, after 5 to 6 days and 10 to 12 days
- 3 Texture of colony. Examine by naked eye, hand lens and low power of the microscope;

texture are classified as velvety or velutinous, subfloccose or floccose and lanose, funiculose, and fasciculate or coremiform, after Raper, Thom and Fennell's description (1949).

4. Character of surface. The colony surface examined by hand-lens or naked eye, is described as smooth, plane or thin, wrinkled or furrowed, and color of the mycelium, and zonate or azonate characters are noted.
5. Character of margin. The characteristics of the colony margin, such as smooth, compact, mealy or granular, fascicle, thin, narrow, broad, etc., color, and width of the marginal zone are examined by naked eye, hand-lens, and low power of the microscope
6. Colony color and color change. Color and shades of conidial areas are classified according to Ridgway's standard after 10 to 12 days and 20 to 22 days. In some cases, colors are listed separately for marginal, subcentral, and central areas

Any characteristic color change during growth is also noted

- 7 Colony reverse: Color and shades of colony reverse are described in the same was as for 6
- 8 Exudate: Transpiration of fluid is a conspicuous feature, and the presence or absence, amount and color are observed
- 9 Pigmentation of substratum: Agar pigmentation is a conspicuous feature, and color and shades, width of pigmentation zone after 10 to 12 days and 20 to 22 days, and characteristic color and shades changes during a growth period of 4 to 5 weeks, are described

(2) Microscopic characteristics of conidia formation

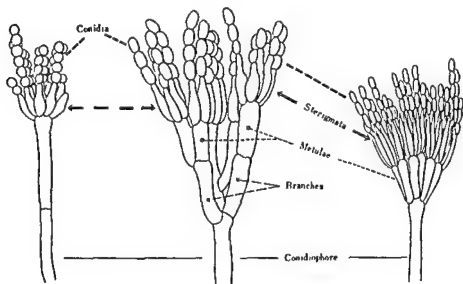
Details of structure are observed or measured by direct observation and also by observation of dry mounts or fluid mounts under microscope.

- 1 Direct observation. Data conidial chains and conidiophore lengths, shape of conidial chains, perithecia and sclerotia, number and arrangement of sterigmata, metulae, etc., are obtained by direct observation of the undisturbed colony or slant under the microscope
- 2 Dry mounts. Data on size, form and marking of conidia, sterigmata, metulae, branches, conidiophore, sclerotia, perithecia, etc., are obtained by microscopic observation of direct dry mount preparations on glass slides
- 3 Fluid mounts. Small masses of conidial structures are picked from the central, subcentral conidial area, quickly washed in 70% alcohol on a glass slide, then mounted in a special fluid (glycerine, 1 alcohol, 2 water, 3), and sealed with melted paraffin to form a semi-permanent preparation

Data on the diameters of apices and the dimensions of sterigmata, metulae, branches, conidiophores, asci, ascospores, etc., are obtained by observation of fluid mount preparations under the microscope

- 4 Electron micrograph observations. As occasion demands, conidia and other detail structures obtained from Czapek agar cultures, incubated for 22 to 30 days at 25 C are put on a clean 200 mesh copper screen on which a thin "Formvar" (Vinyl acetate formaldehyde polymer)

film or Collodion-SiO film have previously been mounted and dried. The specimens are examined with an electron microscope. The electron micrographs are all taken at an electronic magnification of 2500 or 3000 and then enlarged.



V. Classification of the Genus *PENICILLIUM*

Penicilli consisting of single clusters, or verticils of sterigmata at the tips of fertile hyphae or conidiophores; conidiophores usually unbranched, in some forms irregularly branched but with each branch terminating in a distinct and separate monoverticillate penicillus.

. Monoverticillata Section.

Colonies producing perithecia or sclerotia

A. Colonies producing fertile perithecia, but perithecia often ripening late

1 Perithecia firm or sclerotoid at first, ripening from the center outward

a. Penicilli monoverticillate or fragmentary *P. javanicum* series

1 Colonies producing abundant red to reddish brown pigment upon most substrata.

aa Ascospores lenticular, about 25 to 30 μ in long axis, with equatorial ridges generally lacking and furrow often evident only as line, with walls finely roughened

P. javanicum van Beyma

bb Ascospores lenticular, about 20 μ in long axis, with prominent equatorial ridges and furrow, with walls roughened.

P. partum Raper and Fennell

2 Colonies not producing abundant reddish or reddish brown pigment upon most substrata

aa Ascospores lenticular, about 30 to 35 μ in long axis, with furrow evident but not pronounced with walls finely echinulate, penicilli typically monoverticillate.

. . . *P. brefeldianum* Dodge

- bb Ascospores lenticular, about 3.5 to 4.0 μ in long axis with walls strongly echinulate and furrow generally pronounced; penicilli reduced or fragmentary

. . . *P. ehrlichii* Klebahn

- cc Ascospores lenticular, about 4.0 μ in diameter, not furrowed or showing only an equatorial line, with walls smooth; penicilli very reduced, often appearing as single sterigmata

P. leuicum Raper and Fennell

- b Penicilli typically biverticillate but with monoverticillate structures produced, and with perithecia at first sclerotoid and ripening late

Carpenteles series (in the Divaricata)

- 2 Perithecia soft, loose-textured, without a definite or firm outer wall; penicilli commonly fragmentary, often appearing monoverticillate

- a. Ascospores large, 7.0 to 8.5 μ in long axis, broadly elliptical, with 5 to 8 prominent longitudinal flanges or ridges showing in side view, without definite equatorial furrow.

P. striatum Raper and Fennell (in *P. luteum* series)

- b Ascospores small, 2.8 to 3.2 μ in long axis, with a single equatorial ridge or two ridges closely appressed

. . . *P. stipitatum* Thom (in *P. luteum* series)

- B Colonies producing sclerotia, often suggestive of young perithecia but never developing an ascogenous stage

(1) Penicilli strictly monoverticillate

- a Sclerotia produced upon all substrates, hard, brittle, crushing with difficulty, composed of thick walled sclerenchyma-like cells

P. thomii series

- 1) Colonies on Czapek agar seldom developing dull, dark purple colors in reverse.

- 1 Sclerotia colorless or nearly so, borne in small clusters surrounded by conspicuous envelopes of bright orange-red mycelium

P. sclerotiorum van Beyma

- 2 Sclerotia in flesh to pink shades, but in clusters and not embedded in masses of orange-red hyphae

- a Colonies typically in gray-green shades, colonies growing restricted

P. thomii Maire

- b Colonies typically in bright yellow green shades, colonies growing rather broadly

P. thomii Maire var *flavescens* Abe

- 3 Sclerotia in orange-brown shades, not in clusters, often surrounded by loose network of yellow to orange or light brown mycelium

P. lapidosum Raper and Fennell

- 2) Colonies on Czapek agar developing dull, dark purple colors in reverse; sclerotia in light pinkish-brown shades, colonies rather restricted; mycelium in grayish vinaceous or brownish shades.

. . . *P. cinnamomipurpureum* Abe.

- b. Sclerotia produced upon some substrata, not on others including Czapek, comparatively soft, composed of pseudo-parenchymatous cells with walls thickened.

.. .. *P. turbatum* sub-series

1. Colonies on Czapek agar not developing dull, dark purple colors in reverse, somewhat restricted.

.. .. *P. turbatum* Westling

- 2 Colonies on Czapek agar developing dull, dark purple colors in reverse, very restricted

. *P. pusillum* Smith.

- (2) Penicilli typically biverticillate-asymmetrica.

.. .. *P. raistrickii* series (in the Divaricata).

2. Colonies not producing perithecia or sclerotia

(A Conidiophores generally unbranched and bearing single, strictly monoverticillate penicilli.

- 1). Conidia globose to subglobose. *Monoglobosa* series

A) Conidia conspicuously rough-walled

- 1) Colonies generally spreading broadly on most media, growing at 5°C.

1. Conidia conspicuously verruculose or echinulate, reverse in reddish or brownish shades, colonies velutinous

. . . *P. purpurescens* (Sopp) Raper, Thom and Fennell

2. Conidia spinulose, reverse in colorless to pale yellow or pale pinkish shades and sometimes in purplish or violet shades, colonies velvety or velutinous or loosely textured.

..... *P. spinulosum* Thom.

- 2) Colonies growing rather restrictedly upon most media, seldom growing at 5°C.

a Seldom growing on Sakaguchi & Wang agar.

- 1 Conidia conspicuously echinulate, reverse in vinaceous lilac to yellow shades, colonies funiculose.

P. lilacino-echinulatum Abe.

b Growing on Sakaguchi & Wang agar.

- 2 Conidia echinulate or granular, conidial area dull gray or smoke gray shades, reverse in dull yellow shades, colonies floccose

P. restrictum Gilman and Abbott.

- 3 Conidia conspicuously echinulate or tubercles, conidial areas olive green becoming brown shades, reverse colorless or nearly so, colonies floccose.

P. fuscum Sopp Raper, thom Fennell

- B) Conidia smooth or slightly rough-walled (Spines less than 0.1 μ)

- 1) Colonies generally spreading broadly on most media
 1. Conidiophores usually more than $100\ \mu$ in length, seldom growing Sakaguchi & Wang agar *P. frequentans* Westling
 2. Conidiophores very short, colonies funiculose *P. adametzii* Zaleski.
- 2) Colonies growing rather restrictedly upon most media
 - a Usually growing on Sakaguchi & Wang agar
 - 1 Colonies quickly developing bright yellow colors in reverse and agar.
 - i Conidial areas light blue-green or yellow green shades, reverse in bright yellow shades throughout *P. citreo-viride* Biourge
 - ii Conidial areas pale yellow green shades (approaching Sage Green or Vetiver Green), colonies reverse in orange-brown or citrine brown shades in central area *P. citreo-viride* Biourge var. *aeneum* Abe.
 - 2 Colonies quickly developing deep vinaceous to purple colors in reverse and agar *P. vinaceum* Gilman and Abbott.
 - b Seldom growing on Sakaguchi & Wang agar.
 - 1 Vegetative mycelium usually pigmented
 1. Vegetative mycelium yellow to orange or orange-red, conidiophores mostly more than $60\ \mu$ in length, colonies velvety or velutinous
P. multicolor G —M and P.
 - ii Vegetative mycelium white to pale vinaceous, conidiophores mostly less than $60\ \mu$ in length, colonies subfloccose
P. roseo-purpureum Dierckx.
 - 2 Vegetative mycelium seldom pigmented, colonies predominantly funiculose
P. terlikowskii Zaleski
- 2) Conidia elliptical to ovate or subglobose *Monoelliptica* series
 - A Conidia conspicuously rough-walled, echinulate or verruculose or (tuberculate) walls in electron microscopy
 - 1) Colonies growing rather rapidly, spreading, colonies growing at 5°C .
 - 1 Conidial areas in blue green or yellow green shades, reverse in deep violet, violet black or dark fuscous shades *P. trzebinskii* Zaleski
 - 2 Conidial areas in dull yellow green shades, reverse colorless, conidia usually $47\ \mu$ or more in length
P. trzebinskii Zaleski var. *magnum* Sakaguchi and Abe
 - 3 Conidial areas in blackish green or darkish blue-green shades, reverse in purplish vinaceous or greenish shades, localized, usually strongly vanilla-like odor produced *P. trzebinskianum* Abe
 - 2) Colonies growing heavily and restrictedly upon most media, seldom growing at 5°C , conidial areas dark yellow green shades, reverse colorless

- 2) Colonies on Czapek agar developing dull, dark purple colors in reverse; sclerotia in light pinkish-brown shades, colonies rather restricted; mycelium in grayish vinaceous or brownish shades.

... . *P. cinnamomipurpureum* Abe.

- b Sclerotia produced upon some substrata, not on others including Czapek, comparatively soft, composed of pseudo-parenchymatous cells with walls thickened

.... *P. turbatum* sub-series

1. Colonies on Czapek agar not developing dull, dark purple colors in reverse, somewhat restricted.

... . *P. turbatum* Westling.

2. Colonies on Czapek agar developing dull, dark purple colors in reverse, very restricted.

... . *P. pusillum* Smith.

- (2) Penicilli typically biverticillate-asymmetrica.

.. *P. raistrickii* series (in the Divaricata).

2. Colonies not producing perithecia or sclerotia

- (A) Conidiophores generally unbranched and bearing single, strictly monoverticillate penicilli.

- 1). Conidia globose to subglobose. .. . *Monoglobosa* series

- A) Conidia conspicuously rough-walled.

- 1) Colonies generally spreading broadly on most media, growing at 5°C.

1. Conidia conspicuously verruculose or echinulate, reverse in reddish or brownish shades, colonies velutinous.

.... *P. purpurescens* (Sopp) Raper, Thom and Fennell

2. Conidia spinulose, reverse in colorless to pale yellow or pale pinkish shades and sometimes in purplish or violet shades, colonies velvety or velutinous or loosely textured

.. *P. spinulosum* Thom.

- 2) Colonies growing rather restrictedly upon most media, seldom growing at 5°C.

- a. Seldom growing on Sakaguchi & Wang agar.

1. Conidia conspicuously echinulate, reverse in vinaceous lilac to yellow shades, colonies funiculate. *P. lilacino-echinulatum* Abe.

- b Growing on Sakaguchi & Wang agar.

- 2 Conidia echinulate or granular, conidial area dull gray or smoke gray shades, reverse in dull yellow shades, colonies floccose.

. . . . *P. restrictum* Gilman and Abbott

- 3 Conidia conspicuously echinulate or tubercles, conidial areas olive green becoming brown shades, reverse colorless or nearly so, colonies floccose.

P. fuscum Sopp Raper, Thom Fennell.

- B) Conidia smooth or slightly rough-walled. (Spines less than 0.1 μ)

1) Colonies generally spreading broadly on most media.

1. Conidiophores usually more than 100μ in length, seldom growing Sakaguchi & Wang agar . . . , *P. frequentans* Westling
2. Conidiophores very short, colonies funiculose. . . , *P. adametzi* Zaleski

2) Colonies growing rather restrictedly upon most media

a. Usually growing on Sakaguchi & Wang agar.

1. Colonies quickly developing bright yellow colors in reverse and agar.

i. Conidial areas light blue-green or yellow green shades, reverse in bright yellow shades throughout. . . , *P. citreo-viride* Biourge.

ii. Conidial areas pale yellow green shades (approaching Sage Green or Vetiver Green), colonies reverse in orange-brown or citrine brown shades in central area. . . , *P. citreo-viride* Biourge var *acneum* Abe.

2. Colonies quickly developing deep vinaceous to purple colors in reverse and agar. *P. vinaceum* Gilman and Abbott.

b. Seldom growing on Sakaguchi & Wang agar

1. Vegetative mycelium usually pigmented

i. Vegetative mycelium yellow to orange or orange-red, conidiophores mostly more than 60μ in length, colonies velvety or velutinous

. *P. multicolor* G. —M and P

ii. Vegetative mycelium white to pale vinaceous, conidiophores mostly less than 60μ in length, colonies subfloccose.

. *P. rosco-purpureum* Dierckx

2. Vegetative mycelium seldom pigmented, colonies predominantly funiculose

. *P. terlikowski* Zaleski.

2). Conidia elliptical to ovate or subglobose

. *Monocliptica* series

A. Conidia conspicuously rough-walled; echinulate or verruculose or (tuberculate) walls in electron microscopy

1) Colonies growing rather rapidly, spreading, colonies growing at 5°C

1. Conidial areas in blue green or yellow green shades, reverse in deep violet, violet black or dark fuscous shades *P. trzebinski* Zaleski

2. Conidial areas in dull yellow green shades, reverse colorless, conidia usually 47μ or more in length

. *P. trzebinski* Zaleski var *magnum* Sakaguchi and Abe

3. Conidial areas in blackish green or darkish blue green shades, reverse in purplish vinaceous or greenish shades, localized, usually strongly vanilla-like odor produced *P. trzebinskianum* Abe

2) Colonies growing heavily and restrictedly upon most media, seldom growing at 5°C , conidial areas dark yellow green shades, reverse colorless

. . . *P. fusco-flatum* Abe

B Conidia smooth or slightly rough-walled (Spines less than 0.1μ)

(1) Colonies growing broadly spreading.

a Growing on Sakaguchi & Wang agar; conidiophores usually more than 350μ in length

1. Conidia strongly elliptical; colonies in yellow green becoming olive or citrine drab shades, reverse yellow or flesh shades.

. . . *P. lividum* Westling.

2 Conidia elliptical to ovate; colonies remaining yellow green in age or tardily becoming light brown in 4 weeks or more, reverse purplish or violet shades becoming yellow shades . . . *P. aurantio-violaceum* Biourge.

b. Seldom growing on Sakaguchi & Wang agar; conidiophores less than 100μ in length; reverse in vinaceous to reddish shades.

..... *P. chermisimum* Biourge

(2) Colonies growing rather restrictedly upon most media

a. Colonies usually showing strong pigmentation in reverse and agar.

1) Luxuriantly growing on Sakaguchi & Wang agar; reverse and surrounding agar usually strongly pigmented in bright red violet or purplish shades

. . . *P. phoeniceum* van Beyma.

2) Seldom growing on Sakaguchi & Wang agar.

1. Seldom growing at 5°C or 37°C ; conidial areas in deep blue- or bluish gray- or dark yellow green shades; reverse in yellow, orange, reddish, sometimes purplish or violet shades; surrounding agar in bright or pale yellow shades. . . . *P. implicatum* Biourge.

2 Growing at 37°C , seldom growing at 5°C ; conidial areas in bluish gray green shades; reverse and surrounding agar in orange red or red-brown shades. . . . *P. sublateralum* Biourge.

3. Growing at 5°C , seldom growing at 37°C ; conidial areas in pale yellow green shades, reverse and surrounding agar in orange or orange brown or pale vinaceous shades *P. adametzioides* Abe

b Colonies usually showing colorless or slight pigmentation in reverse and agar

1) Colonies typically velvety or velutinous; conidial areas in blackish green or dark blue green shades.

1 Luxuriantly growing on Sakaguchi & Wang agar, seldom growing at 37°C , conidial areas blackish yellow green shades reverse colorless or slightly greenish shades in central areas, localized

P. decumbens Thom var *atro-siccus* Abe

- 2 Seldom growing on Sakaguchi & Wang agar; growing at 37°C; conidial areas in dark blue green shades, reverse usually in brownish red colors in central areas.

P. fellutanum Biourge var. *nigro-castaneum* Abe

- 2) Colonies appearing velvety, but usually with surface lightly floccose; colonies seldom in blackish green or dark blue green colors

- 1 Colonies generally loose textured, consisting of a loose network of interlacing hyphae bearing short conidiphores; reverse colorless, being slightly pinkish or greenish shades *P. decumbens* Thom.

- 2 Colonies close textured, tough, leathery, with margin compact but showing stolon like hyphae, reverse becoming pale vinaceous or pale yellow shades *P. fellutanum* Biourge

- (B) Conidiphores mostly branched, occasionally rebranched, each bearing a terminal monoverticillate penicillus but not arranged as a definite apical verticil of metulae (or branchlets) *Ramigena* series

- 1) Conidia definitely elliptical, and with walls smooth or nearly so

- 1 Conidia strongly elliptical to narrowly cylindrical (capsule shape), with ends broad, not pointed *P. capsulatum* Raper and Fennell

- 2 Conidia elliptical and with ends somewhat pointed

P. cyaneum (B and S) Biourge

- 2) Conidia globose, ovate, or slightly elliptical.

- A Colonies growing restrictedly upon most media

- 1 Conidia globose to subglobose and with walls delicately roughened, in divergent chains, not forming columns *P. waksmani* Zaleski

- 2 Conidia ovate or slightly elliptical, in parallel chains forming compact columns *P. charlesii* Smith

- B Colonies growing rapidly upon most media

- 1 Conidia globose to subglobose and walls loosely roughened

P. charlesii Smith var. *rapidum* Abe

- 2 Conidia globose to ovate and with walls conspicuously echinulate or verruculose. *P. velutinum* van Beyma

II. Penicilli characteristically once-or twice-branched below the level of the sterigmata, typically asymmetrical, irregular, or one-side; sterigmata not lanceolate

Asymmetrica Section.

- (A) Penicilli characteristically strongly divaricate, with individual elements strongly divergent often appearing monoverticillate but so arranged as to produce the appearance of a single branched penicillus

Divaricata Sub-section.

. . . *P. fusco-flavum* Abe

B. Conidia smooth or slightly rough-walled. (Spines less than 0.1μ)

(1) Colonies growing broadly spreading

a. Growing on Sakaguchi & Wang agar; conidiophores usually more than 350μ in length

1. Conidia strongly elliptical; colonies in yellow green becoming olive or citrine drab shades, reverse yellow or flesh shades

. . . *P. lividum* Westling

2. Conidia elliptical to ovate; colonies remaining yellow green in age or tardily becoming light brown in 4 weeks or more, reverse purplish or violet shades becoming yellow shades *P. aurantio-violaceum* Bourge.

b. Seldom growing on Sakaguchi & Wang agar; conidiophores less than 100μ in length; reverse in vinaceous to reddish shades

. . . *P. chermisimum* Bourge.

(2) Colonies growing rather restrictedly upon most media

a. Colonies usually showing strong pigmentation in reverse and agar.

1. Luxuriantly growing on Sakaguchi & Wang agar; reverse and surrounding agar usually strongly pigmented in bright red violet or purplish shades

P. phoenixicum van Beyma

2. Seldom growing on Sakaguchi & Wang agar.

1. Seldom growing at 5°C or 37°C ; conidial areas in deep blue- or bluish gray- or dark yellow green shades; reverse in yellow, orange, reddish, sometimes purplish or violet shades; surrounding agar in bright or pale yellow shades.

. . . *P. implicatum* Bourge.

2. Growing at 37°C , seldom growing at 5°C ; conidial areas in bluish gray green shades; reverse and surrounding agar in orange red or red brown shades.

. . . *P. sublateralum* Bourge.

3. Growing at 5°C , seldom growing at 37°C ; conidial areas in pale yellow green shades, reverse and surrounding agar in orange or orange brown or pale vinaceous shades

P. adametzoides Abe.

b. Colonies usually showing colorless or slight pigmentation in reverse and agar

1) Colonies typically velvety or velutinous; conidial areas in blackish green or dark blue green shades

1. Luxuriantly growing on Sakaguchi & Wang agar; seldom growing at 37°C , conidial areas blackish yellow green shades, reverse colorless or slightly greenish shades in central areas, localized

. . . *P. decumbens* Thom var. *atro-virens* Abe

- 2 Seldom growing on Sakaguchi & Wang agar; growing at 37°C; conidial areas in dark blue green shades, reverse usually in brownish red colors in central areas

. *P. fellutanum* Biourge var. *nigro-castaneum* Abe.

- 2) Colonies appearing velvety, but usually with surface lightly floccose; colonies seldom in blackish green or dark blue green colors

- 1 Colonies generally loose textured, consisting of a loose network of interlacing hyphae bearing short conidiophores, reverse colorless, being slightly pinkish or greenish shades . *P. decumbens* Thom.

2. Colonies close textured, tough, leathery, with margin compact but showing stolon-like hyphae; reverse becoming pale vinaceous or pale yellow shades . *P. fellutanum* Biourge

- (B) Conidiophores mostly branched, occasionally rebranched, each bearing a terminal monoverticillate penicillus but not arranged as a definite apical verticil of metulae (or branchlets) *Ramigena* series.

- 1) Conidia definitely elliptical, and with walls smooth or nearly so

- 1 Conidia strongly elliptical to narrowly cylindrical (capsule-shape), with ends broad, not pointed *P. capsulatum* Raper and Fennell

- 2 Conidia elliptical and with ends somewhat pointed

P. cyaneum (B and S) Biourge.

- 2) Conidia globose, ovate, or slightly elliptical

- A Colonies growing restrictedly upon most media

- 1 Conidia globose to subglobose and with walls delicately roughened, in divergent chains, not forming columns *P. uaksmanski* Zaleski.

2. Conidia ovate or slightly elliptical, in parallel chains forming compact columns *P. charlesii* Smith

- B Colonies growing rapidly upon most media

- 1 Conidia globose to subglobose and walls loosely roughened

P. charlesii Smith var. *rapidum* Abe

- 2 Conidia globose to ovate and with walls conspicuously echinulate or verruculose *P. velutinum* van Beyma

- II Penicilli characteristically once-or twice-branched below the level of the sterigmata, typically asymmetrical, irregular, or one side, sterigmata not lanceolate

Asymmetrica Section.

- (A) Penicilli characteristically strongly divaricate, with individual elements strongly divergent often appearing monoverticillate but so arranged as to produce the appearance of a single branched penicillus

Divaricata Sub-section.

- 1) Colonies producing perithecia, sclerotia, or masses of thick-walled cells.
 - a. Colonies producing true perithecia, at first parenchymatous throughout, then usually sclerotoid, often ripening late. . . . *Carpentiles* series.
 1. Ascospores lenticular, 25 to 30 μ in long axis, with equatorial furrow prominent and walls roughened. Perithecia light gray to grayish black (when wet), usually ripening in 5 to 6 weeks. . . . *P. asperum* (Shear) Raper, Thom and Fennell.
 2. Ascospores lenticular, 50 to 60 μ in long axis, equatorial ridges parallel and often closely appressed, with walls rough. Perithecia buff to light tan, commonly ripening in 3 to 4 weeks. . . . *P. baarnense* v. Beyma
 3. Ascospores lenticular, 28 to 33 μ in long axis, with equatorial area broad, flattened and usually showing two low, widely separated ridges, with walls smooth. Perithecia in cream to light tan shades, usually ripening in 2 to 3 weeks. . . . *P. egyptiacum* v. Beyma
 - b. Colonies producing sclerotia or masses of thick-walled cells, but apparently not developing asci and ascospores at any stage.
 1. Colonies velvety or nearly so upon most substrata, conidiophores arising from the substratum or from aerial hyphae. . . . *P. raistrickii* series
 - a. Conidiophore walls coarsely roughened, sclerotia well organized, firm or stony
 1. Sclerotia very hard, stony, white to light pink in color, vegetative mycelium white *P. raistrickii* Smith.
 2. Sclerotia fairly firm, not sclerotoid, yellow to light brown in color, vegetative mycelium often developing yellow shades from encrustment with yellow granules *P. pulvillum* Turfitt.
 - b. Conidiophore walls finely roughened, true sclerotia lacking but small rounded masses of thick-walled cells evident upon all substrata and particularly upon malt agar *P. soppi* Zaleski
 - c. Conidiophore walls smooth or nearly so
 1. White to pink sclerotia reported *P. rolfsii* Thom
 2. Small masses of heavy-walled cells (as in *P. soppi*) produced in some strains *P. miczynskii* Zaleski.
(see *P. xanthinellum* series)
 2. Conidial areas commonly showing fasciculation, with conidiophores aggregated into more or less well defined bundles or tufts The Fasciculata.
 - a. Sclerotia abundantly produced, often characterizing the colony at temperatures above 20°C *P. gladioli* Machacek.
 - b. Sclerotia reported but seldom produced abundantly *P. italicum* Wehmer.

- 2) Colonies not producing perithecia, sclerotia or masses of thick-walled cell
 - (a) Colonies not showing green, gray-green or blue-green with the ripening of conidia
 1. Colonies developing lilac, vinaceous or violaceous shades

. *P. lilacinum* series.

 - 1—a. Colony reverse developing vinaceous or purple-red shades

. *P. lilacinum* Thom
 - 1—b Colony reverse developing bright yellow shades.

. . *Spicaria violacea* Abbott.
 2. Colonies developing pinkish-buff to avellaneous shades.

. . . *P. humuli* van Beyma.
 - 3 Colonies velvety or nearly so, with conidial areas in tan, cream or near-white shades, never showing green.

. . . Natural mutants of many species
 - (b) Colonies showing some shades of green, gray, gray green, or blue-green with the ripening of conidia
 - (1) Penicilli with divaricate character well marked, sterigmata-bearing branchlets (metulae) scattered on the conidiophores, or commonly only partly aggregated into true verticils

—(A) Ripe conidia typically in pale blue-green or gray-green shades and colony reverse often highly colored

 - (1) Conidial chains strongly divergent and becoming tangled in age, not tending to form columns
 - a) Sterigmata abruptly tapered to narrow conidium-bearing tubes

. *P. janthinellum* series

 - 1) Conidia elliptical, rough with echinulations arranged in spiral or transverse bands

P. daleae Zaleski
 - 2) Conidia smooth roughened, but with echinulations not arranged in spiral or transverse bands
 - a Colony reverse and vegetative mycelium often strongly colored (orange-red, reddish purple, etc) in new isolates

P. janthinellum Biourge
 - b Colony reverse colorless or in yellow to orange shades, vegetative mycelium colorless or light buff to peach shades
 - (1) Conidiophores roughened
 - 1 Colony reverse colorless or yellow shades, penicilli commonly consisting of a terminal verticil of divergent metulae

P. simplicissimum (Oud) Thom
 - 2 Colony reverse near orange shades, penicilli often irregular

P. ochro-chloron Biourge.
 - (2) Conidiophores smooth or nearly so
 - 1 Conidia with conspicuously roughened walls

2 Conidia with smooth or nearly so, walls

. . . *P. muczynskii* Zaleski

-b) Sterigmata not abruptly tapered to conidium-bearing tubes

. . . . *P. godlewskii* Zaleski

-(2 Conidial chains tending to form columns, at least in young cultures, conidia globose to subglobose or ovate. . . . *P. canescens* series

1. Colony reverse orange red or deep red shades; conidia globose, with smooth, or nearly so, walls. . . . *P. nalgiovensis* Laxa.

2. Colony reverse and surrounding agar deep red shades, conidia ovate, with echinulate or verruculose walls . . . *P. echinulo-nalgiovense* Abe.

3 Colony reverse orange becoming rich brown shades; conidia globose with smooth or slightly roughened walls. . . . *P. canescens* Sopp.

4. Colony reverse colorless or in dull peach or yellow shades, not developing dark colors; conidia globose with delicately echinulate walls

. . . *P. jensenii* Zaleski.

-(B Ripe conidia typically in dull gray shades such as steel gray to dark olive gray (Ridgway), globose; colony reverse usually in yellow to deep orange shades.

.. *P. nigricans* series

1) Conidiophore walls smooth or nearly so on all substrata

A. Conidia strongly aculeate or echinulate.

1. Colonies developing dull to dark gray shades; rather restrictedly

P. nigricans (Bainier) Thom.

2 Colonies developing dull to gray-green shades; growing rather rapidly

. . . *P. nigricans* (Bainier) Thom var *sulfuratum* Abe

3. Colonies white or nearly so; light sporulating, floccose.

P. albidum Sopp

B Conidia delicately echinulate.

. . . *P. kapuscinskii* Zaleski

2) Conidiophore walls coarsely roughened, at least on malt agar

1 Conidia aculeate

. . . *P. melinii* Thom

2 Conidia smooth or nearly so

P. raciborskii Zaleski

-(2 Penicilli with divaricata character evident, but tending toward compactly biverticillate with metulae usually borne at a single level and conidia producing compact columns that are typically divergent *P. citrinum* series

-(B Penicilli seldom strongly divaricate, usually compact, with branches and metulae tending to be parallel rather than divergent

(1) Colonies typically velvety, with conidiophores arising characteristically from the substratum in a dense even stand *Velutina* Sub-section.

- (1) Penicilli seldom branched below the level of metulae, with metulae often more or less divergent, seldom growing at 5°C and 37°C, usually growing on Sakaguchi & Wang agar
... P. citrinum series
- a Conidia globose to subglobose
- 1 Colonies showing bright yellow to orange pink shades in exudate or reverse and surrounding agar, penicilli suggesting a symmetrical pattern
... P. citrinum Thom.
- 2 Colonies showing dull yellow to olive buff shades in reverse, sometimes light brown shades; penicilli suggesting divaricate and somewhat irregular pattern
... P. steckii Zaleski
- 3 Colonies quickly becoming greenish olive or dark green shades in reverse on Czapek, steep or Koji-extract agar; penicilli mostly suggesting symmetrical pattern.
P. citreo-virens Abe
- b Conidia elliptical to subglobose
- 1 Usually unequal in length of metulae, 2 to 3 or occasionally 5 verticils; colony reverse in light brown or fuscous shades
P. corylophilum Dierckx.
- 2 Usually unequal in length of metulae, 5 to 8 verticils, colony reverse in colorless or pale yellow shades.
P. corylophiloides Abe
- 3 Usually equal in length of metulae, 5 to 8 verticils, and closely compact; colony reverse in dull yellow shades
P. paxilli Bainier.
- (2) Penicilli typically rebranched below the level of metulae, with main axes and branches terminating in verticils of metulae, usually growing at 5°C
- A) Penicilli commonly long, with elements loosely arranged and often divergent
- 1) Conidiophores smooth walled or nearly so
- 1) Conidia less than 45 μ in long axis, conidial chains often adherent into well-defined columns
P. chrysogenum series
- a Conidia elliptical to ovate, occasionally subglobose.
- a-1 Seldom growing on Sakaguchi & Wang agar, conidia usually more than 30 μ in long axis
- 1 Colonies usually showing abundant yellow exudate and yellow pigmentation in reverse and surrounding agar
P. chrysogenum Thom
 Tan mutant *P. chrysogenum Thom mut fulvescens Takashima,*
 Arima and Abe
- 2 Colonies showing pale or colorless exudate and surrounding agar, brownish colors throughout in reverse
P. meleagrinum Biourge
- a-2 Luxuriantly growing on Sakaguchi & Wang agar, conidia usually less than 30 μ in long axis conidial areas quickly dull green shades
P. meleagrinum Biourge var viridi flavum Abe

- b. Conidia globose to subglobose; seldom growing on Sakaguchi & Wang agar.
 1. Agar surrounding colonies usually broadly yellow pigmented; exudate bright yellow color .. . *P. notatum* Westling.
 2. Agar surrounding colonies usually colorless; exudate colorless or tardily pigmented . . . *P. cyano-fulvum* Bourge.
- 2) Conidia commonly 4.5μ or more in long axis, strongly elliptical.
 - a Conidia elliptical, fairly uniform in size. . . *P. oxalicum* series
 - a-1. Luxuriantly growing at 37°C , colonies plane or nearly so, conidia often forming deep crusts. .. . *P. oxalicum* Currie and Thom.
 - a-2. Seldom growing at 37°C ; colonies radially furrowed, not forming deep crusts, reverse in reddish to maroon shades *P. atramentosum* Thom
 - b. Conidia strongly cylindrical to elliptical varying greatly in size and often very large; penicilli very irregular, often fragmentary.
 - *P. digitatum* series
 - b-1. Colonies rather restrictedly spreading, conidial areas dull yellow green shades. . . . *P. digitatum* Saccardo.
 - b-2. Colonies rather broadly spreading, conidial areas blue-green shades . . . *P. digitatum* Saccardo var. *latum* Abe
 - b-3. Conidia white, otherwise duplicating the species.
 - *P. digitatum* Sacc. var. *californicum* Thom
- 2) Conidiophores typically rough-walled . . . *P. roqueforti* series.
 - a Conidia globose rarely subglobose, colonies usually plane or slightly furrowed on Czapek agar
 - a-1. Conidia smooth walled or nearly so; conidiophore walls with protuberances or larger granules (about 0.6 to 1.0μ in length), luxuriantly growing on Sakaguchi & Wang agar, margin thin and often arachnoid
 - .. . *P. roqueforti* Thom
 - a-1. Conidia delicately echinulate or verruculose walled, conidiophores walls punctate or smaller granules; poorly growing on Sakaguchi & Wang agar; rather compact, seldom producing arachnoid margin
 - P. roqueforti* Thom var. *punctatum* Abe
 - b Conidia elliptical or ovate to subglobose; usually radially furrowed.
 - b-1 Seldom growing on Sakaguchi & Wang agar.
 - 1 Conidia elliptical to subglobose, smooth walled or nearly so; reverse and surrounding agar usually strongly pigmented .. . *P. casei* Staub
 - 2 Conidia ovate to subglobose with spinulose walls; reverse in vinaceous pink shades, surrounding agar milky-like pigment; penicilli suggestive of the *P. breviscompactum* series .. . *P. casei* Staub var. *compactum* Abe

b-2 Luxuriantly growing on Sakaguchi & Wang agar, conidia elliptical to ovate with delicately echinulate or verruculose walls, reverse and surrounding agar colorless or pale yellow shades . . . *P. pseudo-casci* Abe

B) Penicilli comparatively short, compact, with all elements closely pressed

P. brevi-compactum series

1 Conidia globose to subglobose; branches and metulae commonly inflated

P. brevi-compactum Dierckx

2 Conidia elliptical to subglobose, with echinulate or verruculose walls; colonies in yellow green shades

P. stoloniferum Thom

3. Conidia elliptical to subglobose, with echinulate or verruculose walls; colonies in brownish shades

P. brunneo-stoloniferum Abe.

(2) Colonies typically lanose or floccose, without evidence of fascicles or ropes of hyphae, or with such structures reduced and inconspicuous if present . . . *Lanata* Sub-section.

A Colonies predominantly white, remaining so, with the development of ripe conidia or becoming lightly colored in gray-green shades

P. camemberti series

1 Colonies remaining white indefinitely . . . *P. caseicolum* Bainier

2 Colonies with surface becoming pale gray-green or greenish glaucous within 10 to 14 days

P. camemberti Thom

B Colonies quickly developing some shade of green in conidial areas.

P. commune series

1) Vegetative mycelium uncolored and with reverse uncolored or in drab shades, usually heavily sporing on malt agar

a Conidia globose or nearly so, less than 40 u in diameter, finely roughened

P. lanosum Westling

b Conidia elliptical or in age becoming subglobose, commonly up to 40 u or more in diameter, smooth-walled

1 Conidial areas in rather bright yellow-green shades.

P. lanoso-viride Thom

2 Conidial areas bluish green to gray-green

a Conidial areas with blue element pronounced, near bluish glaucous, deeply floccose

P. lanoso-coeruleum Thom

3 Conidial areas with green to gray-green shades predominating, at first court gray to gnaphalium green, becoming olive in age

a Colonies with unusually strong actinomycetes like odor

P. biforme Thom

b Colonies with odor less pronounced

1 Colonies forming a felt 300 to 1000 u deep

. . . *P. commune* Thom

2 Colonies deeply floccose, 1 to 2 mm deep

.. . . *P. lanoso-griseum* Thom

2) Vegetative mycelium yellow to orange, at least adjacent to the substratum; reverse orange to bay; non-sporulating or very lightly sporulating on malt agar.

a Colonies deep, 20 to 30 mm, loosely floccose, lightly sporulating upon Czapek and steep agar. . . . *P. aurantio-candidum* Dierckx

b Colonies thinner, definitely fasciculate, usually heavily sporing on Czapek and steep agars . . . *P. aurantio-virens* Biourge (in *P. viridi-cyclopium* Series

(3) Colonies with surface typically ropy or funiculose from aggregation of aerial hyphae; conidial structures arising primarily from aerial hyphae or ropes of hyphae.

.. . . *Funiculosa* Sub-section

1) Conidial areas in definite yellow-green, blue-green, or gray-green shades; penicilli large, representing the same type as seen in the Lanata and Fasciculata sections; conidiophore walls more or less roughened, but metulae and sterigmata smooth.

.. . . *P. terrestre* series

A Colonies with reverse uncolored or in pale yellow to drab shades.

1. Conidia in bright yellow-green shades . . . *P. psittacinum* Thom

2 Conidia in dull gray-green shades, with conidiophores usually conspicuously roughened . . . *P. terrestre* Jensen

3 Conidia in blue-green shades, with conidiophores smooth or nearly so.

. . . *P. solitum* Westling

B Colonies deeply colored in reverse, in reddish to dark brown shades

P. reticulosum Birk, Raist, and Smith

2) Conidial areas variously colored, not in green shades, penicilli often comparatively narrow with cellular elements laterally compressed; walls of conidiophores, metulae (and often the sterigmata) are closely and conspicuously roughened

. . . . *P. pallidum* series

A Conidia white to cream colored

1 Conidial chains divergent, becoming tangled in age

P. pallidum Smith

2 Conidial chains in well-defined columns.

P. putterilli Thom

B Conidia in light to dull gray shades.

P. namyslowskii Zaleski

C Conidia in light violet, lavender, or vinaceous shades

P. lavendulum Raper and Fennell

(4) Colonies with surface growth appearing mealy, tufted, fasciculate, or coremiform due to aggregation of conidiophores into upright fascicles or bundles

Fasciculata Sub-section

a Sclerotia characteristically produced

- 1 Sclerotia abundantly produced at 25-30°C, less abundantly at lower temperatures; conidiophore walls roughened . *P. gladioli* series, *P. gladioli* Machacek
- 2 Sclerotia or perithecia produced in occasional strains or under special conditions; conidiophores walls smooth.

. *P. italicum* Wehmer

b Sclerotia not produced

- Ⓐ Colonies with simple conidiophores and fascicles intermixed, but with simple conidiophores usually predominating.

ⓐ Colonies lacking true green colors in areas of ripe conidia

P. ochraceum series

- 1 Conidial areas in yellowish olive, buffy olive or buffy brown shades

P. ochraceum (Bainier) Thom

- 2 Conidial areas in lighter shades near sandy brown or pinkish buff.

P. carneo-lutescens Smith

- 3 Conidial areas colorless or in light cream shades.

. Color mutants of *P. claviforme* and *P. urticae*
and other species

ⓑ Colonies characteristically developing yellow-green, blue green or gray green shades in areas of ripe conidia; seldom growing at 37°C

- 1) Conidiophores usually conspicuously rough walled, seldom growing on Sakaguchi & Wang agar

- A) Conidia forming definite crusts which easily break away when the culture tube or dish is tapped

P. crustosum series

. *P. crustosum* Thom

- B) Conidia forming compact crusts which seldom break away when the culture tube or dish is tapped

- 1 Conidia globose or subglobose, smooth or nearly so

- a Agar surrounding colonies usually quickly and broadly pigmented

- 1 Colonies remaining bright yellow green in age or tardily becoming light brown shades

P. viridicatum Westling

- 2 Colonies blue-green slightly bluish-yellow-green or dull yellow green shades

P. viridi cycloprum Abe

- b Agar surrounding colonies colorless or tardily weakly pigmented

- 1 Colonies at first bright or dull yellow green shades but quickly olive or gray green shades.

P. olivino-viride Bourge

- 2 Conidial areas quickly developing dark yellow-green shades

... . *P. palitans* Westling

3. Colonies in blue-green shades but quickly grayish olive shades, slightly fasciculate or often velutinous appearing

... . *P. puberulum* Bainier

- 2-. Conidia globose to subglobose with echinulate or verruculose walls

1. Colonies in yellow-green shades

. *P. palitans* Westling var. *echinoconidium* Abe

2. Colonies in blue green shades.

. *P. cyclopium* Westling var. *echinulatum* Raper, Thom and Fennell

- 3-. Conidia elliptical to ovate with smooth or nearly so walls

1. Conidia elliptical or ovate, colonies in blue-green shades.

.. . *P. cyclopium* Westling

2. Conidia strongly elliptical; non-sporulating or tardily and sparsely growing on malt agar.

. *P. aurantio-virens* Biourge

- 2) Conidiophores smooth walled or nearly so, conidia elliptical

.. . *P. urticae* & *italicum* series

- a. Seldom growing on Sakaguchi & Wang agar.

1. Sterigmata seldom more than 65μ in length.

... . *P. urticae* Bainier

2. Sterigmata usually more than 65μ in length.

. . . *P. expansum* (Link) Thom

- b. Usually growing on Sakaguchi & Wang agar

1. Conidia seldom cylindrical form, colonies in blue-green shades

. . . *P. martensii* Biourge

2. Conidia cylindrical form, colonies in blue or yellow green shades

. . . . *P. italicum* Wehmer

- (B) Colonies with most of the conidiophores arranged in fascicles or in definite coremia; seldom growing at 37°C

- A Conidiophores typically rough walled . . . *P. granulatum* series

- 1 Conidia globose to subglobose *P. corymbiferum* Westling

- 2 Conidia elliptical . *P. granulatum* Bainier

- B Conidiophores smooth walled or nearly so *P. claviforme* series

- 1 Colonies poorly growing on Sakaguchi & Wang agar, coremia typically club-shaped and showing clear differentiation into a compact fibrous stalk and an expanded "sporehead" composed of massed and interwoven penicilli

- 1 1 Conidial areas in green shades *P. claviforme* Bainier

- 1 2 Conidial areas usually white.

P. claviforme Bainier mut *candicans* Abe and Ura

1-3 Conidial areas in olive colors

P. claviforme Bainier mut *olivicolor* Abe and Ura

- 2 Luxuriantly growing on Sakaguchi & Wang agar; coremia typically loose in texture (Isaria-like), often not clearly differentiated into stalk and "sporehead"; commonly appearing feathery, with penicilli usually separate.

P. clavigerum Demelius

- III Penicilli characteristically biverticillate and symmetrical, but sometimes fractional in some species and strains; sterigmata typically lanceolate, with apices long-tapered acuminate.

Biverticillata Symmetrica Section

(1-. Colonies typically producing perithecia or sclerotia

- A Colonies producing soft perithecia upon most substrata, usually in bright yellow (luteus) shades. *P. luteum* series

1. Ascospores usually with prominent equatorial ridges

- a Strains typically thermophilic, colonies pale salmon colored to dull grayish green

P. duponti Griffon and Maublanc emend Emerson

- b. Strains not thermophilic, colonies typically bright yellow to greenish yellow.

P. stipitatum Thom

2 Ascospores without definite equatorial ridges

- a Ascospore spinulose over their entire surface; asci borne in chains

-1 Ascospores elliptical

- a- Perithecia in bright yellow, golden yellow or orange yellow shades

1- Ascospores 40 to 50 u in long axis.

- aa Perithecial initials enlarged, long, clavate, unbranched, colonies spreading broadly *P. vermiculatum* Dangeard

- bb Perithecial initials irregularly enlarged, septate and often branched, colonies somewhat restricted *P. wortmanni* Klocker

2. Ascospores seldom exceeding 30 u in long axis, perithecial initials long helicoid; colonies spreading broadly *P. helicum* Raper and Fennell

- b-. Perithecia in white to cream or light yellowish shades, perithecial initials conspicuously swollen, often becoming branched

P. spiculisporum Lehman

2 Ascospores globose

- a- Conidia elliptical with ends somewhat pointed, perithecia in golden yellow to orange-yellow shades *P. rotundum* Raper and Fennell

- b Conidia bacilliform, rod like, perithecia typically in pale yellow shades

P. bacillosporum Swift

- b Ascospores not spinulose over their entire surface, asci borne singly as short branches

from fertile hyphae

- 1 Ascospores with walls pitted; perithecia in bright yellow shades; conidial heads in avellaneous shades . . . *P. avellaneum* Thom and Turesson
2. Ascospores with conspicuous transverse (spiral) bands ("tricostate" of Zukal); perithecia in bright yellow shades . . . *P. luteum* Zukal
- 3 Ascospores with multiple longitudinal ridges; perithecia white or cream colored . . . *P. striatum* Raper and Fennell

B Colonies producing sclerotia in greater or less abundance upon most substrata.

1. Sclerotia in dark red or blackish shades, often elongate; penicilli typically biverticillate and symmetrical
 - a Sclerotia dark red or reddish black in color, usually more or less rounded and borne upon the substratum . . . *P. purpureogenum* var. *rubri-sclerotium* Thom
 - b Sclerotia black, brownish black, or greenish black, usually elongate, often more or less embedded in the substratum
 - 1-. Sclerotia abundantly produced, often characterizing the culture; conidiophores and metulae conspicuously roughened. . . *P. novae-zeelandiae* v Beyma
 - 2-. Sclerotia sparsely and tardily produced in occasional strains; conidiophores and metulae smooth-walled or nearly so. . . *P. funiculosum* Thom
 - 3-. Sclerotia reported, conidiophores long and comparatively coarse, usually rough walled . . . *P. herquei* series
- 2 Sclerotia in light cream to yellow shades rounded, penicilli biverticillate, sometimes appearing symmetrical.
. . . *P. raistrickii* Smith and allied species. (in the *Divaricata*)

(2) Colonies not producing perithecia or sclerotia

A Colonies regularly developing abundant, erect coremia, often characterizing the culture.

1. Colonies luxuriantly growing at 37°C; penicilli typically biverticillate and symmetrical; sterigmata lanceolate, with tips gradually tapered; colonies developing yellow orange, olive brown or red shades in reverse
P. duclauxi series
. . . *P. duclauxi* Delacroix
2. Colonies seldom growing at 37°C; penicilli typically asymmetrical, sterigmata with tips more abruptly narrowed; colonies seldom developing true red shades in reverse
. . . *P. claviforme* series

B Colonies seldom or never developing true coremia

(1) Colonies usually growing at 37°C.

- (A. Colonies with surface appearing funiclose, floccose-funiclose, or somewhat tufted; conidiophores arising primarily from aerial hyphae or ropes of hyphae
P. funiculosum series
- (a Conidial chains tangled or divergent; metulae parallel or somewhat divergent

- (1. Conidia strongly elliptical or fusiform, smooth or nearly so; colonies usually developing reddish shades in reverse.
 - a)- Colonies seldom growing on Sakaguchi & Wang agar.
 - 1 Colonies usually spreading broadly; metulae closely parallel or somewhat divergent. *P. funiculosum* Thom
 2. Colonies usually more or less restricted; colonies bristly, showing areas of red, orange or yellow mycelium and dark green conidia, conidia usually fusiform. *P. islandicum* Sopp
 - b)- Colonies luxuriantly growing on Sakaguchi & Wang agar; colonies usually spreading broadly; metulae more or less divergent, seldom closely parallel
P. purpureogenum var *rubri sclerotium* Thom
(non sclerotigenic type)
 - (2. Conidia never strongly elliptical or fusiform, colonies never developing true red shades in reverse.
 - 1 Conidia globose or ovate, typically verruculose walls
P. verruculosum peyronel
 - 2 Conidia ovate or sometimes elliptical, with smooth or slightly rough walls; but fractional penicilli usually abundant; conidiophore production suggesting the foot cell of *Aspergillus*. *P. varians* Smith
 - (b) Conidial chains forming a conical or pyramidal mass, metulae numerous, incurved.
P. piccum Raper and Fennell
- (B Colonies typically velvety or lanose, conidiophores arising primarily from the substratum or from the basal felt
P. purpureogenum series
- (1. Colonies consistently producing deep red colors in reverse, surface usually heavy sporing and showing an evident but limited development of yellow or orange-red aerial hyphae
 - a) Strong pigmentation diffusing throughout the surrounding agar, conidia elliptical to subglobose.
 - 1 Metulae closely parallel, colonies growing rather rapidly, sometimes becoming broadly spreading, conidia smooth or slightly roughened
P. purpureogenum Stoll
 - 2 Metulae seldom parallel, usually more or less divergent; colonies more restricted, conidia smooth or nearly so
P. rubrum Stoll
 - b) Pigmentation seldom diffusing throughout the surrounding agar, but tardily developing very light shades, colonies usually developing rather rapidly and broadly
 - 1) Conidia with echinulate or verruculose walls
 - 1 Conidia globose or subglobose. *P. aculeatum* Raper and Fennell
 - 2 Conidia usually ovate, occasionally with one end apiculate,

. . *P. aculeatum* Raper and Fennell var *apiculatum* Abe

- 2) Conidia smooth or nearly so, typical elliptical; metulae usually somewhat divergent; reverse usually in reddish shades in central or subcentral areas localized

1. Sclerotia produced, at least when newly isolated; velutinous or slightly funiculose
.. *P. purpuregenum* var. *rubri-sclerotium* Thom

- 2 Sclerotia not produced when newly isolated, velutinous on Czapek agar, but typically funiculose on steep agar

. *P. purpuregenum* var *rubri-sclerotium* Thom

(non-sclerotigenic type)

- (2 Colonies developing red-orange, yellow-orange or greenish brown rather than deep red colors in reverse; surface usually characterized by prominent areas of sterile yellow aerial mycelium.
.. .. *P. variable* Sopp

- (2) Colonies seldom growing at 37°C, luxuriantly growing on Sakaguchi & Wang agar.

- (A. Conidiophores smooth or nearly so, colonies rather restricted; reverse varying from colorless or yellow to orange-brown shades, and sometimes greenish shades in localized areas, agar surrounding colony usually colorless or with limitedly diffusing heavy or light pigment, colonies velvety or velutinous . . . *P. rugulosum* series

- 1) Colonies usually restricted upon most media; conidia usually more than 30 μ in long axis.

- a Colony reverse usually orange-brown shades throughout or in localized areas, sometimes greenish shades in localized areas.

1. Conidia elliptical, echinulate or verruculose. *P. rugulosum* Thom

- 2 Conidia strongly elliptical, smooth or delicately roughened

P. concavo-rugulosum Abe

- b Colony reverse usually colorless or yellow shades throughout; colonies very thin throughout or with central area somewhat floccose, often wave-like zonate.

. *P. tardum* Thom

- 2) Colonies growing very restrictedly, conidia usually less than 30 μ in long axis

- 1 Metulae seldom numerous and somewhat divergent.

. *P. diversum* Raper and Fennell

- 2 Metulae numerous and definitely inflated or suggesting divaricate.

P. diversum var. *aureum* Raper and Fennell

- (B Conidiophores with roughened walls; colonies developing strong green or greenish-brown shades in reverse, velvety or sometimes floccose.

- (1 Conidiophores usually less than 6 μ or 7 μ in diameter

- a Conidia elliptical

- 1 Conidia smooth or nearly so, strongly elliptical, near rugby ball form, metulae numerous and suggesting divaricate, conidiophore conspicuous roughened

. *P. herqueti* Bainier and Sartory

- 2 Conidia delicately echinulate, less than 3.4μ in long axis, colonies usually spreading broadly; metulae not suggesting divaricate.

. *P. paraherqueti* Abe

- 3 Conidia with verruculose or granular walls; colonies growing rather rapidly.

P. estinogenum Komastu and Abe

- b. Conidia globose or subglobose; sclerotia sometimes very abundant

. . . *P. noiae-zeelandiae* van Beyma

- (2 Conidiophores about 8μ in diameter.

. *P. olsoni* Bainier and Sartory

- IV Penicilli large, usually symmetrical, typically branched at three or more levels below the sterigmata

Polverticillata Section

P. albicans series

. *P. albicans* Bainier

... .. *P. aculeatum* Raper and Fennell var. *apiculatum* Abe

- 2) Conidia smooth or nearly so, typical elliptical; metulae usually somewhat divergent; reverse usually in reddish shades in central or subcentral areas localized.

1. Sclerotia produced, at least when newly isolated; velutinous or slightly funiculose.

... *P. purpurogenum* var. *rubri-sclerotium* Thom

2. Sclerotia not produced when newly isolated, velutinous on Czapek agar, but typically funiculose on steep agar

... *P. purpurogenum* var. *rubri-sclerotium* Thom

(non-sclerotigenic type)

- (2) Colonies developing red orange, yellow-orange or greenish brown rather than deep red colors in reverse; surface usually characterized by prominent areas of sterile yellow aerial mycelium

... *P. variabile* Sopp

- (2) Colonies seldom growing at 37°C, luxuriantly growing on Sakaguchi & Wang agar.

- (A. Conidiophores smooth or nearly so; colonies rather restricted, reverse varying from colorless or yellow to orange-brown shades, and sometimes greenish shades in localized areas, agar surrounding colony usually colorless or with limitedly diffusing heavy or light pigment; colonies velvety or velutinous

... *P. rugulosum* series

- 1) Colonies usually restricted upon most media, conidia usually more than 30 μ in long axis

- a Colony reverse usually orange-brown shades throughout or in localized areas, sometimes greenish shades in localized areas

- 1 Conidia elliptical, echinulate or verruculose

... *P. rugulosum* Thom

- 2 Conidia strongly elliptical, smooth or delicately roughened.

... *P. concavo-rugulosum* Abe

- b Colony reverse usually colorless or yellow shades throughout; colonies very thin throughout or with central area somewhat floccose, often wave like zonate

... *P. tardum* Thom

- 2) Colonies growing very restrictedly; conidia usually less than 30 μ in long axis

1. Metulae seldom numerous and somewhat divergent.

... *P. diversum* Raper and Fennell

- 2 Metulae numerous and definitely inflated or suggesting divaricate.

P. diversum var. *aureum* Raper and Fennell

- (B Conidiophores with roughened walls; colonies developing strong green or greenish-brown shades in reverse, velvety or sometimes floccose.

- (1 Conidiophores usually less than 6 μ or 7 μ in diameter.

- a Conidia elliptical

- 1 Conidia smooth or nearly so, strongly elliptical, near rugby-ball form; metulae numerous and suggesting divaricate, conidiophore conspicuous roughened.

P. herques Bainier and Sartory

- 2 Conidia delicately echinulate, less than 3.4μ in long axis; colonies usually spreading broadly, metulae not suggesting divaricate.

P. paraherques Abe

- 3 Conidia with verruculose or granular walls, colonies growing rather rapidly

P. estinogenum Komastu and Abe

- b Conidia globose or subglobose, sclerotia sometimes very abundant

P. novae-zeelandiae van Beyma

- (2 Conidiophores about 8μ in diameter

P. olsoni Bainier and Sartory

- IV Penicilli large, usually symmetrical, typically branched at three or more levels below the sterigmata

Polverticillata Section

P. albicans series

P. albicans Bainier

I. 培 養 基

A 初期の研究に用いられた培地。

1. Raulin's solution.
2. Bean Agar and Potato agar
3. Potato-Dextrose agar.
4. Licorice Sticks
5. Prune Gelatine.
6. Wort or Beer Wort.

B. 現在の研究に用いられている培養基。

1) ツアヘック寒天培地

蒸留水	1000 c.c.
NaNO_3	30 grams
K_2HPO_4	10 gram
$\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$	0.5 gram
KCl	0.5 gram
$\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$	0.01 gram
蕨粉	30.0 grams
寒天	15~20 grams

(pH 無修正, 7.0 に近い)

2) 似ノアヘック寒天培地 (分離用)

蒸留水	1000 c.c.
NaNO_3	20 grams
$\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$	0.5 gram
KCl	0.5 gram
$\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$	0.01 grams
蕨粉	10.0 grams
寒天	30.0 grams

(使用時に 0.2N-HCl にて 4.3~4.4 にする)

3) ステーブ寒天培地 ノアヘック寒天培地に 10 gms のコーンステイブ液を加えた培地。pH は殺菌時に N-NaOH で 7.0 に修正す。

4) 麦芽汁寒天

麦芽抽出液 (Difco 製)	20 grams
アキストローズ	20 grams
「 〃 」	10 gram
寒天	25.0 grams
蒸留水	1000 c.c.

麦芽汁を添加する時に加えて水に溶かし pH は約 4.7 無修正, 25% 寒天を用い, 殺菌時に培

地を混合す。

他法は、1kg 麦芽に水 5L を加え 65°C で糖化後、濾過し、10% Ballg 液とし、pH 4.7 に修正、20 ~ 25 gr/L の寒天を加えて殺菌す。

- 5) 糖汁寒天、米麹 1kg に水 5L を加え 60°C で糖化後、濾過、10% Ballg 液とし、pH 6.0 に修正、1L 寒天を 20 gr 加えて殺菌す。

- 6) コーンミール寒天培地。

50 gr 攪割干蜀黍宛に 1L の水で 1 時間煮き後、濾過、原液量にし、20 g/L の寒天を加えて殺菌す。

- 7) 乾草煮沸寒天培地：

50 g 乾草を水 1L で 30 分間加圧後、濾過、 K_2HPO_4 2 g と寒天 20 g を加える、pH は HCl にて 6.2 とし殺菌する。

- 8) 20% 蔗糖ノアヘック培地

3% 蔗糖を 20% とする以外ノアヘック寒天培地と同様、pH 無修正。

- 9) 坂口工氏寒天培地（亜硝酸培地）：

ノアヘック寒天培地組成中の 30 g 硝酸ソーダの代りに亜硝酸ソーダを 15 g 加えた培地、pH は NaOH にて 7.0 とする。

II. 培養法

1) 試験管培養

本法はヘニシリウム菌株を取扱うには必ず用いる培養法であり、試験管の移植は菌糸又は分離胞子の選択した小塊を白金線にて移し植える事である。送られて来た菌株標本或は新しく自然界から分離した菌株を研究する場合、如何なる研究を行う前にも先ず試験管の移植をする必要がある。併しながら本培養法は正式の観察には次の諸理由にて不都合である。

- ① 集落の面積が一般的に非常に小さく且つ總ての培養特性を示さない。
- ② 直接低倍率の検査が不可能である。
- ③ 適当なる顕微鏡用標本を作成する場合に生育した集落の適当なる部分を計り深く採取が出来ず、且容易に取り上げ難い。

然し、試験管培養は人体の培養諸特性を知るのには便利である

2) 平板培養

- a) 点培養 最も普通に用いられている方法で、凡培養の標んだ所より分生胞子の塊又は菌糸の小片を平皿に移植を行い集落を形成せしめる

又平板上の希望する所に限られた数の集落を出現せしめたいときには、殺菌水或は溶かした約 45°C のメスに分生胞子を懸濁し、この胞子懸濁液を少量新しい平板培地に移して培養を行う

観察用には一、二、又は以上の集落が望ましく、この場合は上記方法にて行う

- b) 試験管平板培養 試験管平板にて単一集落を形成せしめる培養法で、培養の度合、栄養源の濃度に影響する寒天層の厚さの変化の影響、又は集落発育の比寸或は様相へ著しく影響する因子等を研究する事が出来る 本法は多くの菌株の一般的特性による識別に便利である

- c) 稀釈培養法 本法は或る種の実験、特に土壤又は他の自然界の菌株の分離には非常に有用である 又汚染の結果二つ又はそれ以上の菌が混生した時の分別に役立つ

本法は試料の少量を希した氷人又は殺菌水に入れ、氷人が塊まめ様に汁で深く混ぜ、ビレット又は白金線でこの懸濁液の少量を第2番目の氷人又は殺菌水試験管に移し、又之を3番目に移し、試料の望ましい稀釈液を作成する。

この稀釈氷人はヘトリンシャーレーに注入し、固化せしめ、又一方水稀釈液は氷人平板上に少量注入し培養を行う。

d) 線条培養：天然試料よりのヘニシリウムの分離或は二つ以上の菌株を分別するには本培養は上記(c)よりも一層容易である。本培養にては試料の最少量を移植し且つ各集落が分別して発育するように充分の距離を取って線条を行う必要がある。又本培養はヘニシリウムの不安定な菌株に於ける自然変異の研究に屢々用いられる。

e) 単胞子培養 稀釈培養に於て単一細胞より発育する真の $\%$ は元液中に存在する分生胞子を、血球計測器での計測値と出現集落数を比較し決定出来る。然し単一胞子より生育した集落であるか、又は二つ或は以上の細胞より生育した集落であるかを探知する事は不可能である。研究者は単一胞子より生育した集落であることを確め知る必要がある場合は、micro-manipulator 又は cutting disk 法を用う。

別法としては精淨剤のラウリルスルホン酸ソーダの15倍稀釈殺菌水に分生胞子を良く分散せしめ、この適当稀釈液を培養氷人上に注意深く拡散せしめ適温(25°C)にて一夜培養すると発芽す。このシャーレーを型皿双眼顕微鏡にて檢視し、分離した発芽細胞の位置に印を附し、次いで顕微鏡下で分離用の細胞附近に未発芽胞子が存在せぬ事を確めて印を附す。白金線で作ったスハチュラにて押込んだ分生胞子の周辺が氷人も一緒に小塊を低倍率検鏡下で新しい氷人平板上に移植し、更に押込んだ発芽胞子が移植されたかを再確認す。

III. 分離、撰択、点培養

自然界の各種試料からのヘニシリウム菌株の分離には稀釈培養又は線条培養法を行い(必要に応じて稀釈す)。25°C又は30°Cにて4~5日間培養して出現した単一集落より分生胞子をソアベック氷人試験管に移植し、25°Cに、5~7日間培養す。之等の新しく分離した数多くの菌株から集落の各特性に基づいて同一様菌株を選び出し次に全菌株について単胞子分離法を行って後、集落特性の厳密な観察に依り、特長的な菌株を撰択す。

以上の単胞子分離又は稀釈法にて自然界から分離した時と同一様と認められる各菌株を次の同定に用いる。

同定方法は常に5~7日間25°Cに培養したソアベック氷人上に生育した normal strain (正常菌株)の一点より分生胞子の小塊をヘトリンシャーレー氷人上に点移植(Spot inoculation)を行い、培養日数に従ひ後記諸特性を厳密に按じ所採菌株(Species)を決定する。

著者等は一つのヘトリンシャーレーに一つの集落を形成せしめ、各試験には常に同一条件に3枚以上を用い、上記各種培養地を用いて5', 15', 25', 30', 37°Cの各温度に培養を行った。Raper, Thom, Fennell 氏等は常に一つのヘトリンシャーレーに3集落を形成せしめる方法を採用した。

IV. 観察と記載

(1) 集落の諸特性

- 1) 生育の程度 各培養温度に於ける5日目、10~12日目、20~22日目(又は必要に応じて以上)の集落の直径を計測する
- 2) 集落の形 培養5~6日目又は10日目の集落の円周部から中心に向かって集落の断片を切り取りスラ

イト上に載せ、集落円周部、中間部、中心部の高さ(厚み)を計測す。

3. 集落の菌叢 肉眼、拡大鏡、又は顕微鏡の低倍率にて、Raper, Thom, Fennell 氏等 (1949) の記述せる所謂ヒロート状、類似ピロー状、幾分か縮毛状、縮毛状又は羊毛状、又は羊毛状、又は束状或は結束糸状の何れかを観察決定する。

4. 集落表面 本特性は拡大鏡又は肉眼にて、前面、下面或は側面、皺、隆起線があるか、菌糸の着色、輪生状の発育を呈するか等の諸特性を観察記載す。

5. 集落円周部の特性 集落円周部の諸特性即ち滑面、皺面、粉状 又は顆粒状、束状、幹い、狭い、広い、菌糸の呈色、円周部の幅等は肉眼、拡大鏡、顕微鏡の低倍率にて観察す。

6. 集落呈色及び色調の変化 分生孢子菌生部の着色又は色調は培養 10~12 日目及び 20~22 日目の色合を Ridgway Color table に照合し、記載す。或る場合には集落円周部、中間部、中心部と着色調が異なっているのを別々に記載す、之等の色調の変化は生育期間を通じて観察す。

7. 集落裏面 集落裏面の呈色、色調は6同様である

8. 溶出物 水滴の発現は著しい特色であり、その有無、量、着色、色調を観察す

9. 培地の着色 本地の着色は著しい特色で、培養 10~12 日目又は 20~22 日目の着色の幅、その呈色、色調を記し、4~5 週間生育期の特長的呈色、又は色調の変化を記述する。

2) 顕微鏡観察に依る諸特性。

微細構成体の観察並びに計測は次の4法に依り記載す

1. 直接観察法 分生孢子連鎖、分生孢子柄の長さ、分生孢子連鎖の形、被り器、菌核、梗子、基附梗子、分枝等の分枝菌生状態及数 等は顕微鏡下で集落又は斜面培養を壊さずに直接観察す。

2. 乾燥標本法 分生孢子、梗子、基底梗子、分枝、分生孢子柄、被り器、菌核等の計測 形、側面の採相のデータはガラススライド上に乾燥標本を作って縮鏡し記載する

3. 液体標本法 分生孢子構成体の小塊をガラス スライド上で 70% のアルコールで丁寧に洗い、グリセリン、1 アルコール、2 水、3 の溶液に移し変え、パラフィンで封して永久標本を作る 梗子、基底梗子、分枝、分生孢子柄、子囊、子囊胞子等の各サイズは液体標本の縮鏡にて記載す

4. 電子顕微鏡写真法 必要に応じて 分生孢子及其他の微細構造は 25°C、22~30 H 培養のノアヘック底入培養より "Formvar" film (Vinyl acetate formaldehyde polymer) 或は Collodion SiO film の 200 ミクロン製スクリーン上に貼り乾付

本標本を電子顕微鏡にて縮鏡、2500~3000 倍の写真を撮り、後引伸ばして計測、顕微鏡大測結果と照合その正確度を補足す

V. ペニシリウム属の分類

I ヘニラスは単一房状、菌糸又は分生胞子柄の先端に梗子の群生を有し、分生胞子柄は通常分岐せず、或る場合は不規則に分岐しているが各々分岐が明確に分れて単輪生状ペニラスを有す。

、 Monoverticillata Section (単輪生区)

1. 集落に被子器、菌核を形成す。

A. 豊富に被子器を形成、時に成熟が遅れる。

1. 被子器は最初頭丸又は菌核様で、中心部より順次成熟す、

a. ヘニラスは単輪生状又は断片的

、 P. javanicum series

1 多くの培養にて赤色或は赤褐色調色素を形成、

aa 子実胞子はレンズ状、 $25 \times 30 \mu$ 、赤道様隆起線は欠、縦々線の如き皺があり、明瞭な粗面

... P. javanicum van Beyma

bb 子実胞子はレンズ状、長さ約 2.0μ 、明瞭な赤道様隆起又は皺を有し、粗面、

... P. parvum Raper and Fennell

2. 培地に赤色又は赤褐色調色素を不形成、

aa 子実胞子はレンズ状、長軸は $30 \sim 35 \mu$ 、皺は明確にあるが著しくはない、大刺状粗面、ペニラスは単輪生状

... P. prefeldianum Dodge

bb 子実胞子はレンズ状、長軸は $35 \sim 40 \mu$ 、著しい大刺状粗面、著しい皺を有し、ヘニラスは少く且つ断片的、

... P. ehrlichii Klebahn

cc 子実胞子はレンズ状、径約 40μ 、皺はなく、赤道様線を示し滑面；ヘニラスは非常に少なく、
縦々単一梗子様

P. levitum Raper and Fennell

b. ペニラスは双輪生状、単輪状も偶り、被子器は最初菌核様で成熟が遅い。

Carpentiles series (in the Divaricata)

2 被子器は稀く、不明確な菌糸に覆れ、ヘニラスは一般的に断片的で、縦々単輪生状

a. 子実は大きく、長軸 $70 \sim 85 \mu$ 、幅広い楕円形、 $5 \sim 8$ ヶの明確な縦線様、凸縁又は隆起があり、明瞭な赤道様皺ではない。

P. striatum Raper and Fennell (in P. luteum series)

b. 子実是小、長軸 $28 \sim 32 \mu$ 、単一赤道様隆起線或は二つの近接した隆起線を有す

P. stipitatum Thom (in P. luteum series)

B 集落は菌核を形成、縦々若い被子器を暗示せしめるが、しかし子実形成時には生存せず、

(1) ヘニラスは純単輪生状、

a 菌核は是の培地上にて形成、硬く、壊れ難く、又潰すに困難、若い発細胞組織様細胞から出来て

P. thomii series

1) ノアヘック寒天培養の集落裏面は、くすんだ又暗紫色を呈せず

1 菌枝は無色で、輝橙赤色菌糸にて包まれている。

P. sclerotiorum van Beyma

2 菌枝は薄茶又は桃色調、併し橙赤色菌糸に包まれていない。

a. 集落は灰緑色調、集落直径は小

P. thomis Maire

b. 集落は輝黄緑色調、集落直径やや大

P. thomis Maire var. *flavescens* Abe

3 菌枝は橙褐色調、黄、橙又は明褐色菌糸の不明瞭な菌糸帯に包まれていて、反状にはならぬ。

P. lapidosum Raper & Fennell

2) ノアヘック寒天上の集落裏面はくすんだ又は暗紫色調、菌枝は明桃褐色調、集落は直径小；菌糸は灰青紫桃色又は褐色調。

P. cinnamopurpureum Abe

b 菌枝は数種の培地では形成するがノアヘック寒天培地等では作らぬ、比較的柔らかく、厚い壁の似柔軟細胞組織で構成されている。

P. turbatum sub-series

1 ノアヘック寒天上の集落裏面はくすんだ、又は暗紫色調にならぬ、直径幾分か小。

P. turbatum Westlugh

2 ノアヘック寒天上の集落裏面はくすんだ又は暗紫色調、集落直径は非常に小。

P. pusillum Smith

(2) ヘニシラスは不整質双輪生状

P. raistrickii series (in the *Divaricata*)

2 集落は被了器或は菌枝を作らぬ。

【A 分生胞子柄は一般的に分枝せず、単一な直單輪生状ヘニシラスを形成す。

(1 分生胞子は球形又は亜球形

Monoglobosa series

A) 分生胞子は著しい粗面

1) 集落は一般的に多くの培地上で直径大、5°C にて発育す。

1 分生胞子は著しく人きな疣状又は刺状粗面、集落裏面は赤又は褐色調、菌叢ピロート状

P. purpurrescens (Sopp) Raper, Thom Fennell

2 分生胞子小刺状粗面、集落裏面無色又は薄黄、薄桃色又時々紫或は赤色調、菌叢ピロート状、又は不明瞭な菌叢を呈す。

P. spinulosum Thom

2) 集落は多くの培地で直径むしろ小、5°C にて発育せず

a ぬい・王培地に発育せず

1 分生胞子は著しく人刺状粗面 集落裏面は薄桃黄色又は黄色調 菌叢は繖状。

P. lilacino-echinulatum Abe

b 坂口・I 培地に发育

- 2 分生子は人刺又は顆粒粗面, 分生子子実部はくすんだ灰色又は煙灰色調, 集落裏面はくすんだ黄色調, 菌糸綿毛状。

.. *P. restrictum* Gilman & Abbott

- 3 分生子は著しい人刺状又は塔状粗面, 分生子子実部はスリーブ緑色から暗灰褐色調に変わる, 集落裏面は無色, 菌糸は綿毛状

.. *P. fuscum* (Sopp) Raper, Thom & Fennell

B) 分生子は滑面又は 0.1μ 以下の僅少な粗面。

1) 集落の直径大。

- 1 分生子柄は常に 100μ 以上の長さ, 坂口・I 培地に生育す。

.. *P. frequentans* Westling

- 2 分生子柄は非常に短く, 菌糸は縄状

.. *P. adametzi* Zaleski.

2) 集落の直径極小。

a. 坂口・I 培地に生育。

- 1 集落裏面及び寒天は速やかに煙黄色調に着色。

- i 分生子は軽い青緑又は黄緑色調, 裏面は全面鈍黄色調

.. *P. citreo-viride* Bourge.

- ii 分生子は薄黄緑色調 (Sage Green, Vetiver Green に近い), 集落裏面の中心部は棕褐色或はスリーブ緑褐色調,

P. citreo-viride Bourge var. *aeneum* Abe.

- 2 集落裏面及び寒天は濃い薄紫褐色又は紫色調

.. *P. vinaceum* Gilman & Abbott

b 坂口・I 培地に发育不能

- 1 菌糸は通常着色す。

- i 栄養菌糸は黄, 橙, 橙赤色, 分生子柄は 60μ 以上の長さ, 菌糸はピロート又は類似

P. multicolor G.M and P

- ii 栄養菌糸は白色又は薄紫褐色, 分生子柄は 60μ 以下の長さ, 菌糸やや綿毛状

P. roseo-purpureum Dierckx

- 2 栄養菌糸は着色せず 集落は縄状に密んでいる

P. terlikoessku Zaleski.

(2) 分生子は楕円又は卵形或は卵球形

Monoelliptica series

A 分生子は著しい粗面, 電子顕微鏡写真にては人刺状は縄状又は(小刺状)粗面。

- 1) 集落は寒天発育早く 直径大, 5 C にて発育す

- 1 分生子は着色深は青緑又は黄緑色調, 集落裏面暗単色, 単黒色或は濃紫褐色調

P. trzebinsku Zaleski

- 2 分生孢子着生部は黄緑色調、裏面無色；分生孢子の長軸 45μ 以上。

.. *P. trzebinskii* Zaleski var *magnum* Sakaguchi and Abe

- 3 分生孢子着生部は黄緑或は暗青緑色調；裏面は部分的に紫褐色或は緑色調；常に強いバナナ様芳香を作る。

.. *P. trzebinskianum* Abe.

- 2) 集落は殆んどの培地上にて直径小； 5°C に發育せず；分生孢子着生部は暗黄緑色調、裏面無色。

.. *P. fusco-flavum* Abe

B. 分生孢子滑面或は 0.1μ 以下の微小粗面。

(1) 集落直径大。

- a 坂口・王塚地に發育す；分生孢子柄は長さ 350μ 以上。

1. 分生孢子は楕円形；集落黄緑色順次オリーブ又は暗オリーブ褐色、裏面黄色、或は黄褐色調。

P. lividum Westling.

- 2 分生孢子楕円又は卵形、集落は黄緑並れて4週間以上にて黄褐色調、裏面紫或は単色順次黄色調

P. aurantio-violaceum Biourge

- b 坂口・王塚地に發育不能、分生孢子柄は長さ 100μ 以下、集落裏面薄黄褐色又は赤色調。

P. chermisinum Biourge.

(2) 集落の直径小。

- a. 集落の裏面及寒天は著しく着色す。

- 1) 坂口・王塚地によく生育、集落裏面及び周辺寒天鮮赤赤又は紫色調。

P. phoeniceum van Beyma

- 2) 坂口・王塚地に發育不能。

- 1 5°C 或は 37°C にて發育不能、分生孢子着生部は黄青緑又は青灰緑或は暗黄一緑色調、集落裏面は黄、橙、赤色又時に紫或は莖色調、周辺寒天は橙或は黄褐色調。

P. imphicatum Biourge

- 2 37°C に發育、 5°C にて發育不能。分生孢子着生部は青灰緑色調、集落裏面又は周辺寒天は橙赤或は赤褐色調

P. sublateralitum Biourge

- 3 5°C に發育、 37°C に發育不能。分生孢子着生部は黄緑色調；集落裏面又は周辺寒天橙、又は橙褐色又は薄黄褐色調。

P. adametzoides Abe

- b 集落の裏面及び寒天は無色又は僅かな着色

- 1) 集落はヒョート状又は類似菌雲、分生孢子着生部は黄緑又は暗青緑色調

- 1 坂口・王塚地に生育、 37°C に發育不能、分生孢子着生部は黄緑色調、裏面は無色或は部分的に中心部僅少な緑色調

P. decumbens Thom var *atro-turens* Abe

2 坂口・王埒地に發育不能；37°Cにて生育；分生胞子乳色部は暗青緑色調 集落裏面は中部褐赤色調。

... .. *P. fellutanum* Biourge var. *nigro-castaneum* Abe

2) 集落菌叢ピロッド状、しかし常に表面作小棉毛状、集落は黒緑或は暗青緑色。

1. 集落菌叢は不明確で、短い分生胞子柄を持った交錯菌糸帯を有し、裏面は無色、順次作小桃又は緑色調。

... .. *P. decumbens* Thom.

2. 集落は緻密な菌叢で、強靱、且硬く、集落門周部は硬く、且つ細綫菌糸を有す、裏面薄褐色或は薄黄色調。

... .. *P. fellutanum* Biourge.

(B. 分生胞子柄は殆んど分枝、屢々再分枝し各々車輪生状ベニノラスを有す、しかし基底梗子、(或は分枝の如き菌生ではない。

... .. *Ramigena* series

1) 分生胞子は明確な楕円形、滑面。

1 分生胞子は楕円又は両端が尖らず、広い円筒形(カプセル形)。

... .. *P. capsulatum* Raper and Fennell.

2 分生胞子は両端が幾分か尖っている。

... .. *P. cyaneum* (B and S) Biourge.

2) 分生胞子球形、卵形、或は幾分か楕円。

A 集落は直径小。

1. 分生胞子は球形又は亞球形、少し粗面、分生胞子連鎖は散開状で、門柱状にはならぬ。

... .. *P. toaksmani* Zaleski

2. 分生胞子は卵形又は作小楕円形分生胞子連鎖は平行状、又は緻密な門柱状。

... .. *P. charlesii* Smith.

B. 集落は直径大。

1. 分生胞子は球状乃至は亞球形、幾分か粗面。

... .. *P. charlesii* Smith var. *rapidum* Abe

2. 分生胞子は球形乃至は卵形、著しい太刺又は柱状粗面。

... .. *P. velutinum* van Beyma.

II ヘニノラスは基底梗子の下位にて特長的に一回乃至は二回分枝；不整齊状で不規則或は一方的；梗子は節状ではない

... .. *Asymmetrica* Section

(A ヘニノラスは特長的に著しい散開状で、個々の構成体も同様で、屢々車輪生状を示すが、単一分枝したヘニノラスの様相を呈する如く菌生してゐる。

... .. *Divaricata* Sub-section.

(I 集落は被了器 菌枝を作る。

a 集落は被了器を作る 最初は柔軟細胞組織であり屢々硬れるが常に常細胞組織になる。

... .. *Carpentless* series

- 1 f 子囊胞子はれんず状、長軸は $25\sim30\mu$ 、赤道様皺が著しく且つ粗面。

被子器は灰色又は灰黒色（湿った時）、5~6 週間目に成熟す。

.. *P. asperum* (Shear) Raper Thom & Fennell.

- 2 子囊胞子はれんず状、長軸 $50\sim60\mu$ 、赤道様隆起線は並行し又屢々重複し粗面。被子器は 3~4 週間にて成熟し、薄黄緑、又は明るい褐色調。

.. *P. baarnense* v. Beyma.

- 3 f 子囊胞子はれんず状、長軸 $28\sim33\mu$ 、赤道様皺は広く、平頭で常に二つの低い、幅広くはなれた隆起を示し、滑面。被子器は 2~3 週間目に成熟し、クリーム色乃至明るい褐色調。

.. *P. egyptiacum* v. Beyma

- b 集落は菌枝又は厚い型の細胞の塊りを形成、しかし子囊又は子囊胞子を形成せず。

- 1 集落はピロート様菌叢、分生胞子柄は基質又は気菌糸より生育す。

.. *P. raistrickii* series

- a 分生胞子柄粗面、菌枝はよく構成され、硬く強固な。

- 1 菌枝は硬く、白又は桃色調、朱養菌糸は白色。

.. *P. raistrickii* Smith

- 2 菌枝は非常に堅牢だが、柔軟細胞組織ではなく、黄色乃至は褐色調、朱養菌糸は黄色調で、黄色顆粒状に被さる。

.. *P. pulvillum* Turfitt.

- b 分生胞子柄は明確な粗面、真の菌枝ではないが殆んどの培地上にて厚型の細胞の小円塊を形成、特に麦芽汁水入にては著しい。

.. *P. soppi* Zaleski

- c 分生胞子柄は滑面。

- 1 白色又は桃色菌枝を形成。

P. rolfsii Thom

- 2 厚型細胞の小塊（*P. soppi* の如き）を成る菌枝で形成。

P. micznuski Zaleski (*P. janthinellum* series)

- 2 菌叢は結束糸状で、分生胞子柄は多少束状又は房状に集生している。

The Fasciculata

- a 菌枝は豊富に形成、屢々 20 C 以上の培養温度の集落にて特長的。

P. gladioli Machacek

- b 菌枝は形成すと報告されたか、余り豊富には形成せぬ。

P. italicum Wehmer

- (2 集落は被子器、菌枝、厚型の細胞塊を形成せず。

- (a 集落の分生胞子は緑 灰緑或は青緑色調を呈せず。

- 1 集落は緑色、青桃色又は赤色調

P. lilacinum series

- 1-a 集落表面は薄桃又は紫青色調

P. lilacinum Thom

2. 坂口・王塚地に發育不能；37°C にて生ず；分生胞子褐色部は暗青綠色調、集落裏面は中心部褐赤色調。

... .. *P. fellutanum* Biourge var. *nigro-castaneum* Abe

- 2) 集落菌叢ピロッド状、しかし常に表面僅小綿毛状、集落は黒緑或は暗青綠色。

1. 集落菌叢は不明確で、短い分生胞子柄を持った交錯菌糸帯を有し、裏面は無色、順次僅小な塊又は綠色調。

.. .. *P. decumbens* Thom

- 2 集落は緻密な菌叢で、強靱、且硬く、集落円周部は硬く、且つ細密菌糸を有す、裏面薄褐色或は浮黃色調。

.. .. *P. fellutanum* Biourge.

- (B 分生胞子柄は殆んど分枝、屢々再分枝し各々單輪生状ベニシラスを有す、しかし基底梗子、(或は分枝)の如き着生ではない。

.. Ramigena series.

- 1) 分生胞子は明確な楕円形、滑面。

- 1 分生胞子は楕円又は両端が尖らず、広い円筒形(カプセル形)。

.... .. *P. capsulatum* Raper and Fennell

2. 分生胞子は両端が幾分か尖っている。

.. .. *P. cyaneum* (B and S.) Biourge

- 2) 分生胞子球形、卵形、或は幾分か楕円。

- A. 集落は直径小。

- 1 分生胞子は球形又は亞球形、少し粗面、分生胞子連鎖は散開状で、円柱状にはならぬ。

.. .. *P. waksmani* Zaleski

2. 分生胞子は卵形又は僅小楕円形分生胞子連鎖は平行状、又は緻密な円柱状。

.. .. *P. charlesii* Smith.

- B 集落は直径大。

1. 分生胞子は球状乃至は亞球形、幾分か粗面。

.. .. *P. charlesii* Smith var. *rapidum* Abe.

2. 分生胞子は球形乃至は卵形、著しい大刺又は孔状粗面。

.. .. *P. velutinum* van Beyma

- Ⅱ ヘニシラスは基底梗子の下位にて特長的に一回乃至は二回分枝；不整齊状で不規則或は一方向的；梗子は鉗針状ではない

Asymmetrica Section.

- (A ヘニシラスは特長的に著しい散開状で、個々の構成体も同様で、屢々單輪生状を示すが、單一分枝したヘニシラスの模相を呈する如く着生してゐる。

Divaricata Sub-section.

- (1 集落は梗子器、菌柱を作る

- a. 集落は梗子器を作る 最初は柔軟細胞組織であり屢々互れるが常に分細胞組織になる。

Carpentless series

- 1 子實體子はれんず状、長軸は 25~30 μ 、赤道様皺が著しく且つ粗面

被子器は灰色又は灰黒色(湿った時)、5~6 週間に成熟す。

.. *P. asperum* (Shear) Raper, Thom & Fennell.

- 2 子實體子はれんず状、長軸 50~60 μ 、赤道様隆起線は並行し又時々重複し粗面。被子器は 3~4 週間にて成熟し、薄黄褐色、又は明るい褐色調。

.. *P. baarnense* v. Beyma

- 3 子實體子はれんず状、長軸 28~33 μ 、赤道様域は広く、平坦で常に二つの低い、幅広くはなれた隆起を示し、滑面。被子器は 2~3 週間にて成熟し、クリーム色乃至明るい褐色調。

.. *P. egyptiacum* v. Beyma.

- b 集落は菌枝又は厚い壁の細胞の塊りを形成、しかし子實體又は子實體子を形成せず。

- 1 集落はピロート様菌叢、分生胞子柄は基質又は気菌系より生育す。

.. *P. raistrickii* series.

- a 分生胞子柄粗面、菌枝はよく構成され、硬く強固た。

- 1 菌枝は硬く、白又は桃色調、栄養菌糸は白色。

.. *P. raistrickii* Smith

- 2 菌枝は非常に堅平だが、傘膜細胞組織ではなく、黄色乃至は褐色調、栄養菌糸は黄色調で、黄色顆粒状に被さる。

.. *P. pulvillorum* Turfitt

- b 分生胞子柄は明確な粗面、真の菌枝ではないが殆んどの培地上にて厚壁の細胞の小門塊を形成、特に夏芽汁寒天にては著しい。

.. *P. soppi* Zaleski

- c 分生胞子柄は滑面。

- 1 白色又は桃色菌枝を形成。

P. rolfsii Thom

- 2 厚壁細胞の小塊(*P. soppi* の如き)を成る菌枝で形成。

P. miczanski Zaleski (*P. janthinellum* series)

- 2 菌叢は結束糸状で、分生胞子柄は多少束状又は房状に集生している。

The Fasciculata

- a 菌枝は豊富に形成、屢々 20 C 以上の培養温度の集落にて特長的。

P. gladioli Machacek

- b 菌枝は形成すと報告されたか、余り豊富には形成せぬ

P. stahurum Wehmer

- (2 集落は被子器、菌枝、厚壁の細胞塊を形成せず。

- (a 集落の分生胞子柄は緑 灰緑或は青緑色調を呈せず。

- 1 集落は褐色、薄桃色又は単色調

P. lilacinum series

- 1-a 集落表面は薄桃又は紫赤色調

P. lilacinum Thom

1-b. 集落裏面は桃黄色調。

... *Spicaria violacea* Abbott.

2 集落は桃色又は薄桃紫色調。

... *P. humuli* van Beyma

3. 集落はピロート状、分生胞子着生部は褐色、クリーム又は白色調で、緑色は呈せず。

... Natural mutants of many species

(b) 集落は分生胞子が成熟したとき緑、灰色、灰緑、或は青緑色調。

④-1. ヘニノラスは顕著な散開型特性で、分生胞子柄上にて梗子を持った分枝又は基底梗子が散開状に着生、或は単に輪生状様に集合したる如し。

-(A. 成熟した分生胞子は薄青緑、灰緑色調又集落裏面は度々褐色色す。

-(1) 分生胞子連鎖は著しい散開型で順次鏈状になるが、円柱状にはならぬ。

-a) 梗子は細く急に尖っている。

... *P. janthinellum* series

1) 分生胞子は楕円、大刺状突起が螺旋形に又交叉帯状に着した相面。

.. *P. daleae* Zaleski

2) 分生胞子は滑面又は粗面；突起が螺旋形に又交叉帯状には着生せず。

a. 新しく分離したときは集落裏面、栄養菌糸は著しい濃紫色（橙、赤色、赤紫色、等）

P. janthinellum Bourge

b 集落裏面は無色或は黄、棕色調、栄養菌糸は無色、或は薄黄、薄桃色調。

(1) 分生胞子柄は粗面。

1. 集落裏面は無色又は黄色調；ヘニノラスは散開状基底梗子の末端着生を有す

.. *P. simplicissimum* (Oud) Thom

2 集落裏面は棕色調；ヘニノラスは不規則。

P. ochro-chloron Bourge

(2) 分生胞子柄は滑面。

1. 分生胞子は著しい粗面

P. piscarium Westling

2. 分生胞子は滑面

P. miczynskii Zaleski

-b) 梗子は急激に尖っていない

P. godlewskii Zaleskii

(2) 分生胞子連鎖は円柱状を呈し；分生胞子は球形、亜球形、又は卵形。

P. canescens series

1 集落裏面は橙赤或は濃赤色調、分生胞子は球形、滑面。

P. nalgovensis Laxa

2 集落裏面及び周辺部人は濃赤色調；分生胞子は卵形、大刺又は鈍状粗面。

P. echinulo-nalgoviense Abe

3. 集落の裏面は棕色順次赤褐色調；分生胞子は球形，滑面又は僅少粗面。

. *P. canescens* Sopp

4. 集落裏面は棕色或は薄桃又は黄色調，暗褐色にはならぬ，分生胞子は球形，幾分か刺状粗面。

. *P. jensenii* Zaleski.

- (B) 成熟分生胞子は鉄灰色又は暗オリーブ灰色の如き，くすんだ灰色調，球形，集落裏面は黄又は濃棕色調。

P. nigricans series

- 1) 分生胞子柄は滑面。

- A 分生胞子は著しい尖った大刺状又は大刺状粗面。

- 1 集落はくすんだ，又は暗灰色調；集落直径小。

P. nigricans (Bainier) Thom

- 2 集落はくすんだ又は暗灰色調；集落直径大。

. *P. nigricans* (Bainier) Thom var. *sulfuratum* Abe

- 3 集落は白色調，僅少分生胞子の着生；綿毛状菌叢。

P. albidum Sopp

- B 分生胞子幾分か大刺状粗面。

P. kapuscinskii Zaleski

- 2) 分生胞子柄，粗雑な粗面，麦芽汁斜面で特に著しい

- 1 分生胞子尖った大刺状粗面。

P. melinii Thom.

- 2 分生胞子滑面。

. *P. raciborskii* Zaleski

- ②-2 ヘニシラスは散開状なれども，基底胞子が単一の位置に常に着生した綴合様の双輪生状を呈し且分生胞子連鎖は明らかに散開した綴合な円柱状。

P. citrinum series

- (B) ヘニシラスは著しい散開状を呈せず，常に綴合で散開状より窄ろ並行状着生の分枝並びに基底胞子を有している。

- (1) 集落は著しいピロート状で，分生胞子柄は基質より特長的に一樣に生育す。

Velutina Sub-section.

- (1) ヘニシラスは基底胞子より下位の分枝はせず，基底胞子は多少散開状，5°C, 37°C にて発育不能，坂口・王培地に発育す

P. citrinum series

- a 分生胞子は球形又は亜球形

- 1 集落は発出物，裏面，周辺大人にて輝黄色又は橙桃色調；ヘニシラスは整齐双輪生状の如し

P. citrinum Thom

- 2 集落は裏面にてくすんだ黄色又はオリーブ褐色，又時に薄褐色調，ヘニシラスは幾分か散開型又は不規則様

P. steckii Zaleski

- a 2. 37°C に発育不能、集落は放射状の皺を有し、分生胞子は厚い外皮様は呈せず、裏面は赤色又は濃赤紫色調。

. . . *P. atramentosum* Thom.

- b 分生胞子は円筒形又は楕円、大きくサイズに振れがあり、又時々超大型混在；ヘニシラスは不規則且断片的。

. . . *P. digitatum* series,

- b-1. 集落の直径小で、分生胞子着生部はくすんだ黄緑色調。

. *P. digitatum* Saccardo

- b-2 集落は寧ろ直径大、分生胞子着生部は青緑色調。

. *P. digitatum* Saccardo var *latum* Abe

- b 3. 分生胞子は白色；他特性は同一様。

P. digitatum Sacc. var *californicum* Thom

2) 分生胞子柄は粗面。

. . . *P. roqueforti* series

- a. 分生胞子は球形、稀に亜球形；集落はノアヘック穴天にて常に平面或は僅少な皺を形成。

- a-1. 分生胞子は滑面；分生胞子柄は刺状又は大顆粒状（0.6~0.1 μ 程度）の突起粗面；坂口・王培地によく発育；集落円周部薄く且時々蛛網状。

P. roqueforti Thom.

- a-2 分生胞子は少々刺状又は疣状突起粗面；分生胞子柄は斑点状或は小顆粒状；坂口・王培地では少しく発育；集落は寧ろ緻密で、集落円周部は蛛網状を呈せぬ。

. *P. roqueforti* Thom var *punctatum* Abe.

- b. 分生胞子は楕円又は卵形乃至亜球形；常に放射状皺を有す。

- b-1 坂口・王培地上に発育せず。

- 1 分生胞子は楕円又は亜球形、滑面；裏面又は周辺穴天は常に著しく紫色す。

P. casei Staub

2. 分生胞子は小刺状粗面、卵形又は亜球形、集落裏面は薄肉褐色、集落周辺穴天はミルク様白色；ヘニシラスは *P. brevi-compactum* series の如し。

P. casei Staub var. *compactum* Abe

- b 2 坂口・王培地にてよく発育；分生胞子は楕円又は卵形、少し大刺状又は疣状粗面 集落裏面又は周辺穴天は無色又は薄黄色調。

P. pseudo-casei Abe

B) ヘニシラスは比較的短く、緻密、各構成份は近接しておし合っている如し。

P. brevi-compactum series

- 1 分生胞子は球形又は亜球形、分枝又は基底梗子は一一般的に影鼠状に希り。

P. brevi-compactum Dierckx.

- 2 分生胞子は楕円又は亜球形、大刺状又は疣状粗面、集落は黄緑色調

P. stoloniferum Thom

- 3 分生胞子は楕円又は亜球形、大刺状又は疣状粗面、集落は褐色調

P. brunneo-stoloniferum Abe

(2) 集落は綿毛状で、束状又はロープ様菌糸はなく、ペニシラスは少ない。

..... *Lanta* sub-section

A 集落は白色で、成熟期も同様で、順次灰緑色調になる。

... *P. camemberti* series.

1. 集落は不明瞭な白色。

... .. *P. caseicolum* Bainier.

2 集落は 10~14 日以内に薄灰緑又は薄緑青色調を呈す。

. *P. camemberti* Thom.

B 集落は分生胞子着生部にて緑色調を速やかに呈す。

.. *P. commune* series.

1) 栄養菌糸は無色又は集落裏面は無色又は薄紫紫色調、常に発芽中には著しい分生胞子着生す。

a 分生胞子は球形、 4.0μ 以下、著しい粗面。

. *P. lanosum* Westling

b. 分生胞子は楕円又は順次亜球形、一般的に 4.0μ 或は以上、滑面。

1. 分生胞子着生部暗黄緑色調。

... *P. lanoso viride* Thom.

2 分生胞子着生部は青緑乃至灰緑色調。

a 分生胞子着生部は香味強く、青緑色、厚い綿毛状。

P. lanoso-coeruleum Thom

3 分生胞子着生部は緑色乃至灰緑色調、順次オリーブ色調。

a 集落は強い放線菌様香氣あり。

... .. *P. biforme* Thom

b 集落は香氣顕著ならず。

1. 集落は $300\sim 1000\mu$ 菌糸帯を形成。

... . *P. commune* Thom

2 集落は高い綿毛状、高さ $1\sim 2\text{ mm}$

... *P. lanoso-griseum* Thom.

2) 栄養菌糸は少くとも基質に近接した附近では黄色又は橙色；集落裏面は橙色又は褐色；分生胞子着生無く、発芽中寒天にて僅少着生す。

a 集落の高さは $20\sim 30\text{ mm.}$ 、多少綿毛状、ツアベック、ティープ寒天にては僅少な分生胞子の着生を示す

.. *P. aurantio-candidum* Dierckx

b 集落は薄く、明確な束状、ノアベック、スティープ寒天にて著しい分生胞子着生を示す

P. aurantio-virens Biourge (in *P. viridi-cyclopium* series)

(3) 集落は気菌糸の集合にてロープ状又は縄状；分生胞子構成体は気菌糸又はロープ状菌糸より着生す

Funiculosa Sub-section.

(1) 分生胞子着生部は黄緑、青緑、又は灰緑色調、ヘニシラスは大、*Lanata*, *Fasciculata* section と同一様、分生胞子柄は多少粗面、併し基底梗子、梗子は滑面

P. terrestre series

A 集落裏面は無色或は薄黄乃至薄紫色调。

1 分生孢子呈黄绿色调。

P. psittacinum Thom

2 分生孢子はくすんだ灰绿色调分生孢子柄は常に若い粗面。

P. terrestre Jensen.

3 分生孢子は青绿色调, 分生孢子柄は滑面。

P. solitum Westling

B 集落裏面黄白色, 赤色又は暗褐色调。

P. restrictulosum Birk. Raist. and Smith.

(2) 分生孢子着生部は各種青色, 緑色调は呈せず, ペニノラスは時々比較的細く各構成体は側面に押された如し, 分生孢子柄, 基底梗子(梗々, 梗子)は多少又は若い粗面。

P. pallidum series

A 分生孢子白又はクリーム青色。

1 分生孢子連鎖は散開状, 順次螺旋状を呈す。

P. pallidum Smith

2 分生孢子連鎖は明確な円螺旋状。

P. putterlicki Thom

B 分生孢子は薄い又はくすんだ灰色调。

P. namyslowski Zaleski

C 分生孢子は薄灰色, 黄白色, 薄紫褐色调。

P. lavendum Raper and Fennell

(4) 集落は束状又は括った如く分生孢子柄が束合しているために粉状, 総状, 束状又は結束糸状を呈す。

Fasciculata Sub-section.

a 菌枝を特長的に形成す。

1 菌枝は 25~30°C にて豊富に作るが低温では少く作らぬ, 分生孢子柄は粗面。

P. gladioli series *P. gladioli* Machack

2 菌枝或は被了器を成る菌株にて又は特殊な条件下で形成; 分生孢子柄は滑面。

P. italicum Wehmer

b 菌枝は不形成。

(A) 集落は単一分生孢子柄と束状とか混り合っているが, 単一分生孢子柄が常に豊富

(1. 集落の成熟分生孢子は黄の緑色を呈せず。

P. ochraceum series

1. 分生孢子着生部は黄オリーブ色, 薄オリーブ又は薄褐色调

P. ochraceum (Bainier) Thom

2 分生孢子着生部は薄褐色又は薄桃色调

P. carno-lutescens Smith

3. 分生胞子着生部は無色或は薄クリーム色調。

P. claviforme & *P. urticae* 及び他の species の変異株。

②. 集落は特長的に成熟分生胞子着生部は黄緑、青緑、灰緑色調; 37°C に発育不能。

1) 分生胞子柄は常に著しい粗面、坂口・王塚地に発育不能。

A) 分生胞子は培養試験管、及器を少しく叩くのみで容易に壊れる如き外皮を形成す

... *P. crustosum* series *P. crustosum* Thom

B) 分生胞子は培養試験管或は器を軽く叩くのみでは容易に壊れぬ緻密な外皮を形成す。

... *P. viridi-cyclopium* series

1- 分生胞子は球形又は垂球形、滑面。

a. 集落周辺寒天は常に速やかに又幅広く着色す。

1. 集落は鮮黄緑色調或は順次薄褐色調、

... *P. viridicatum* Westling

2. 集落は青緑、少し青味を帯びた黄緑色、或はくすんだ黄緑色調。

... *P. viridi-cyclopium* Abe

b. 集落周辺寒天は無色或は近く僅少着色す。

1. 集落分生胞子着生部は初め鮮又はくすんだ黄緑色調しかし、速やかにオリーブ或は灰緑色調を呈す。

... *P. olivino-viride* Biourge

2. 分生胞子着生部は速やかに暗黄緑色調。

... *P. paltrans* Westling

3. 集落は青緑色調併し速やかに灰オリーブ色、併かに束状又はビロード状様外觀を呈す。

P. puberulum Bainier,

2- 分生胞子は球形又は垂球形、大刺状又は疣状粗面。

1. 集落は黄緑色調

P. paltrans Westling var. *echinoconidium* Abe

2. 集落は青緑色調、

... *P. cyclopium* Westling var. *echinulatum*
Raper, Thom and Fennell.

3- 分生胞子は楕円又は卵形、滑面。

1. 分生胞子は楕円又は卵形、集落は青緑色調

... *P. cyclopium* Westling

2. 分生胞子は楕円形、麦芽汁寒天にては分生胞子不着生或は遅れて又は粗粒に発育す。

... *P. aurantio-urens* Biourge

2) 分生胞子柄滑面 分生胞子柄円形

P. urticae & *italicum* series

a. 坂口・王塚地に不生育

1. 枝の長さ 65 μ 以下

P. urticae Bainier

2 梗子長さ 65 μ 以上。

P. expansum (Link) Thom

b 坂口・王塚地に生育。

1 分生胞子は円筒形ではなく、集落は青緑色調。

P. martensii Bourge

2 分生胞子は円筒形、集落は青或は黄緑色調。

P. italicum Wehmer

(B) 集落は殆どどの分生胞子柄が束状又は結束系状; 37°C に発育不能。

A 分生胞子柄は粗面。

P. granulatum series.

1 分生胞子は球形又は近球形。

P. corymbiferum Westling

2 分生胞子楕円形。

P. granulatum Bainier.

B 分生胞子は滑面。

P. claviforme series

1 集落は坂口・王塚大では幾分か生育す、結束系は(ゴルフ使用)クラブ形で、粗密な繊維様の分生胞子柄と、分生胞子柄の塊りと交錯したヘニノラスからなっている膨脹した所謂(Sporehead)胞子頭とは明らかに区別し得る。

1-1 分生胞子着生部は緑色調。

P. claviforme Bainier.

1-2 分生胞子部に灰色。

P. claviforme Bainier mut. *caudicans* Abe & Ura.

1-3. 分生胞子はナリーブ色調。

P. claviforme Bainier mut. *olivicolor* Abe & Ura

2 坂口、上埴地に良く生育、結束系状で(Isaria-like)刺状。時々分生胞子柄と、ヘニノラスは常に別れ羽毛状外観を呈する胞子頭(Spore head)とは明確に区別し得ない。

P. clavigerum Demelius.

III ヘニノラスは特長的に整齊放射状、しかし時には或る菌株又は菌株にては断片的; 梗子は槍錐状で、先端は長く次第に細く尖り、尖状

Biverticillata-Symmetrica Section.

(1) 集落は担子器又は菌移を形成

A 集落は柔かい被り器形成、通常黄黄色調

P. luteum series.

1 イ菌胞子通常著しい赤道隆起す

a 菌株は低温性で、集落は薄桃色又はくすんだ灰緑色調。

P. dupontii Griffon and Moublane emend Emersom

b 菌株は高温性でない、集落は黄又は緑黄色調。

P. stipitatum Thom

2 イ菌胞子は顕著な赤道隆起を有せず

a イ菌胞子は表面全体に小刺状粗面、イ菌は連鎖様に着生。

1 イ菌胞子は楕円

a-. 被了器は輝黄、金黃色又は橙黄色調、

1-. 子實體子は長軸 $40\sim 50\mu$

aa 被了器の最初は伸長、長く、膨らみ分岐せず；集落は直径大、

... .. *P. vermiculatum* Dangeard

bb. 被了器の初めは不規則に伸長、隔壁が出来、又屢々分岐す；集落は幾分か直径小。

... .. *P. wortmanni* Klocker

2- 子實體子は長軸 30μ を超えぬ；被了器の初めは長く、螺旋状；集落の直径大

... .. *P. helicum* Raper and Fennell

b-. 被了器は、白色、クリーム又は薄黄色調；被了器の初めは著しく膨脹し、屢々分岐して来る。

... .. *P. spiculisporum* Lehman.

-2. 子實體子は球形。

a-. 分生胞子は両端が幾らか尖った楕円形；被了器は金黃色又は橙黄色調。

... .. *P. rotundum* Raper and Fennell

b-. 分生胞子はバクテリア型又は棒状；被了器は薄黄色調。

... .. *P. bacillosporum* Swift

b. 子實體子は表面全体小刺状粗面を呈せず；子實體は豊沃菌糸より短く分岐したる如く単一に着生す。

1. 子實體子は斑点状粗面；被了器は輝黄色調；分生胞子は薄桃褐色調。

... .. *P. arellanum* Thom and Turesson

2. 子實體子は著しい交叉帯を有し；被了器は輝黄色調。 *P. luteum* Zukal

3. 子實體子は多数の輕線様の隆起を有し；被了器は白色又はクリーム色調。

P. striatum Raper & Fennell

B. 集落は多く又は少なく菌核を形成。

1. 菌核は暗赤色又は黒色調、屢々伸脹す、ヘニラスは整齊双輪生状、

a 菌核は暗赤色或は赤黒色調、常に多少円形で、集落裏面の基質に着生する。

P. purpurogenum var. *rubri-sclerotium* Thom

b 菌核は黒色、褐黒色、或は緑黒色調、常に伸脹し、屢々多少基質に埋まっている。

1 菌核は豊富に作り、屢々特長的に；分生胞子柄又は基底梗子は著しい粗面、

P. novae-zeelandiae v Beyma

2. 菌核は粗雑に又或る菌株では遅く形成、分生胞子柄及び基底梗子は滑面

... .. *P. funiculosum* Thom

3 菌核形成、分生胞子柄はく凡つ比較的粗雑な粗面、

P. herqueti series

2 菌核は薄クリーム又は黄色調、円形、ヘニラスは双輪生状で、時に整齊的

P. raistrickii Smith and allied species. (in *Divaricata*).

(2) 集落は被了器及び菌核を形成せず

A 集落は直立した刺束身形成

1. 集落は 37°C によ、リ力、ヘニラスは整齊輪生状、梗子は前鋒状、先端は次第に細くなっている；

集落の裏面は黄橙 ナリマ褐色或は赤色調

P. duclauxi series

P. duclauxi Delacroix

2. 集落は 37°C に生育不能; ヘニラスは不整齊; 梗子先端が急激に細い; 集落裏面は赤色調を呈せず。
P. claviforme series

B 集落は結束糸を形成せず。

(1) 集落は 37°C に生育

- (A 集落表面は縄状、綿毛様縄状又は幾分か戻状; 分生胞子柄は気菌糸又はロープ状菌糸より生育す。

P. funiculosum series.

(a 分生胞子連鎖は縄状又は散開状; 基底梗子は並行状又は幾分か散開状。

(1. 分生胞子は楕円又は紡錘形、滑面、集落は裏面に赤色調。

a)- 集落は坂口・王培地に発育不能。

1 集落は直径大; 基底梗子並行状又は幾分か散開状。

P. funiculosum Thom

2 集落は多少直径小、菌叢ピロート状、菌糸赤、黄橙色調、分生胞子暗緑色; 分生胞子紡錘形。

P. islandicum Sopp

b)- 集落は坂口・王培地によく発育; 集落は常に直径大、基底梗子は多少散開状で、並行状ではない。

P. purpurogenum var *rubri sclerotium* Thom (non sclerotogenic type)

(2 分生胞子は長楕円又は紡錘形にはならぬ、集落裏面は真の赤色調は呈せず。

1 分生胞子は球形又は卵形、疣状粗面。

P. verruculosum Peyronel

2 分生胞子卵形又は時に楕円形、滑面或は僅少粗面; 断片的ヘニラスが多い; 分生胞子柄はアスヘルギルスの (foot cell) の如きものを形成。

P. varians Smith

(b 分生胞子連鎖は円錐形又は角錐状地形成、基底梗子は数多く且つ内側に曲っている。

P. piceum Raper and Fennell

-(B 集落はピロート状又は下毛状、分生胞子柄は基質又は草葉菌糸帯から生育。

P. purpurogenum series

-(1 集落裏面は赤色調、分生胞子菌生多く且つ黄、橙赤色気菌糸制限的に形成。

a) 集落周辺寒天に濃着色、分生胞子は楕円又は亜球形。

1 基底梗子は近接した並行状、集落発育やや早く、又時に直径大、分生胞子滑面又は僅少粗面。

P. purpurogenum Stoll

2 基底梗子並行状ならず、常に多少散開状、集落は直径非常に、小、分生胞子滑面。

P. rubrum Stoll

b) 集落周辺寒天に色着透過せず、近れて僅少は帯色、集落直径やや大。

1) 分生胞子は大剣状又は丸状粗面、

1 分生胞子は球形又は亜球形

P. aculeatum Raper and Fennell

2 分生胞子は卵形 尾々一端が尖っている

P. aculeatum Raper and Fennell var *apiculatum* Abe

2) 分生胞子は滑面、楕円；基底梗子は常に幾分か散開状；集落裏面は中心部又は中間部にて部分的に赤色調呈色。

1. 菌核形成；ピロード状又は稀少繩状菌叢。

.. *P. purpurogenum* var. *tubri-sclerotium* Thom.

2. 新分離時も菌核不形成；ソアベック寒天にてピロード状、ステープ寒天にては明確な繩状

.. 同上 (Non-sclerotigenic type)

-(2) 集落裏面赤色調よりも赤橙、黄橙、又は緑褐色調；表面は常に黄色気菌糸豊富が特徴。

.. *P. variable* Sopp

《2》 37°C にて発育不能、坂口・王培地に発育良好。

-(A) 分生胞子柄は滑面；集落は窄ろ直径小；集落裏面は無色、部分的黄、橙褐色調、時には緑色調；集落周辺寒天は無色、部分的に濃く又は薄く滑色；集落はピロード状又は類似菌叢。

... *P. rugulosum* series

1) 集落は直径小；分生胞子長軸 30 μ 以上。

a. 集落裏面、全面又は部分的に橙褐色調、時には緑色調。

1. 分生胞子楕円形、大刺状又は疣状突粗面。... *P. rugulosum* Thom

2. 分生胞子長楕円形、滑面又は僅かに粗面。... *P. concavo-rugulosum* Abe.

b. 集落裏面常に全面無色又は黄色調；集落全面人髪薄く、又中心部は幾分か輪毛状、屢々輪毛状生育を示す。

.. *P. tardum* Thom.

2) 集落直径非常に小；分生胞子は長軸にて 30 μ 以下。

1. 基底梗子多くなく且つ幾分か散開状。.. *P. diversum* Raper and Fennell

2. 基底梗子多数且膨脹し恰も *Divaricata* のベニシラスの如し。

.. *P. diversum* var. *aureum* Raper and Feuehl

-(B) 分生胞子柄は粗面；集落裏面は緑色又は緑褐色調ピロード状又は時には綿毛状、

(1) 分生胞子柄直径 6~7 μ 以下。

-a 分生胞子楕円形。

1 分生胞子は滑面、楕円形、ラグビーボールに類似型；基底梗子多く、且散開状様着生；分生胞子柄著しい粗面。

P. herqueti Bainier and Sartory.

2 分生胞子少し大刺状粗面；長軸 34 μ 以下；集落直径大；基底梗子の着生散開状ならず。

P. paraherqueti Abe.

3 分生胞子疣状又は顆粒状粗面、集落やや直径大。

P. estinogenum Komastu and Abe.

-b 分生胞子球形又は亜球形、菌核時に豊富に形成。

P. novae-zeelandiae van Beyma

(2) 分生胞子柄、直径約 8 μ

P. olsoni Bainier and Sartory

へーシラス 整齊状にて、梗子の上部3段以上分岐す

Polyverticillata Section.

P. albicans series.

P. albicans Bainier.

Atlas and descriptions
of *Penicillia*

- 2) 分生胞子は滑面、楕円；基底梗子は常に幾分か散開状；集落表面は中心部又は中間部にて部分的に赤色調呈色。

1. 菌核形成；ピロード状又は伴少繩状菌叢。

... *P. purpureogenum* var. *rubri-sclerotum* Thom

- 2 新分離時も菌核不形成；ソアベック寒天にてピロード状，ステープ寒天にては明確な繩状

... 同上 (Non-sclerotigenic type)

- (2) 集落表面赤色調よりも赤橙，黄橙，又は緑褐色調；表面は常に黄色気菌糸豊富が特長。

... *P. variable* Sopp

【2】 37°C にて発育不能，坂口・玉埴地に発育良好。

- (A) 分生胞子柄は滑面，集落は窄ろ直径小；集落表面は無色，部分的黄，橙褐色調，時には緑色調；集落周辺部又は無色，部分的に濃く又は薄く黄色；集落はピロード状又は類似菌叢。

... *P. rugulosum* series

- 1) 集落は直径小；分生胞子長軸 30 μ 以上。

- a 集落表面，全面又は部分的に橙褐色調，時には緑色調。

- 1 分生胞子楕円形，大刺状又は疣状突起面。

... *P. rugulosum* Thom

- 2 分生胞子長楕円形，滑面又は僅かに粗面。

... *P. concavo-rugulosum* Abe.

- b 集落表面常に全面無色又は黄色調；集落全面大変薄く，又中心部は幾分か綿毛状，層々輪生状生育を示す。

P. tardum Thom

- 2) 集落直径非常に小；分生胞子は長軸にて 30 μ 以下。

- 1 基底梗子多くなく且つ幾分か散開状。

P. diversum Raper and Fennell

- 2 基底梗子多数且膨脹し恰も *Divaricata* のベニシラスの如し。

... *P. diversum* var. *aureum* Raper and Feuln

- (B) 分生胞子柄は粗面；集落表面は緑色又は緑褐色調ピロード状又は時には綿毛状。

- (1) 分生胞子柄直径 6~7 μ 以下。

- a 分生胞子楕円形。

- 1 分生胞子は滑面，楕円形，ラグビーボールに類似型；基底梗子多く，且散開状様着生；分生胞子柄著しい粗面。

P. herquet Bainier and Sartory.

- 2 分生胞子少し人刺状粗面，長軸 34 μ 以下；集落直径大；基底梗子の着生散開状ならず。

.. *P. paraherqueti* Abe

3. 分生胞子丸状又は顆粒状粗面；集落やや直径大。

P. estinogenum Komastu and Abe.

- b. 分生胞子球形又は亜球形，菌核時に豊富に形成

.. *P. novae-zeelandiae* van Beyma.

- (2) 分生胞子柄 直径約 8 μ

.. *P. olsoni* Bainier and Sartory

ベニシラス 整齊状にて，梗子の下位3段以上分岐す。

Polyverticillata Section.

P. albicans series

.. *P. albicans* Bainier.

Atlas and descriptions
of *Penicillia*

1. *Penicillium sclerotiorum* van Beyma.

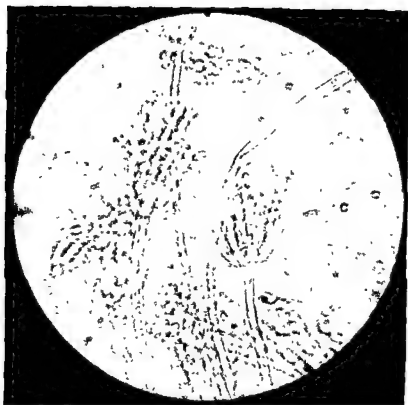


Fig. M-1. *Penicillium sclerotiorum* van Beyma, FAT 1181, detail of penicilli

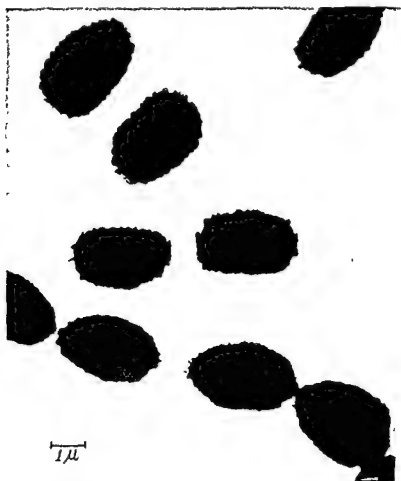


Fig E-1. *Penicillium sclerotiorum* van Beyma, FAT 1181, conidia showing the slightly rough walls and the elliptical form

1. *Penicillium sclerotiorum* von Beyma.

Colonies on Czapek agar growing somewhat restrictedly, attaining a diameter of about 25mm in 10 to 12 days at 25°C, 30 mm at 30°C; not grew at 37°C; (growing little or not on NO₂-medium, variable in color and texture, depending upon the relative abundance of sclerotia, vegetative hyphae, and conidial structures, varying from essentially conidial presenting a velvety appearance, through more or less floccose from the development of abundant vegetative mycelium, to predominantly sclerotia with limited development of fruiting structures or of aerial vegetative hyphae, frequently showing these different aspects as sectors in the same colony; conidial structures limited or abundant, at first arising primarily from the substratum and en masse producing areas near artemesia green or glaucous shades, in age often developing from aerial hyphae over the entire colony surface, vegetative mycelium in flame scarlet or grenadin red shades; sclerotia uncolored or nearly so, typically borne in fairy definite clusters surrounded by envelopes of sterial encrusted hyphae in fairy definite bright orange red shades near scarlet to brazil red (Fig C-1), exudate abundantly produced, English red or flame scarlet; odor slight, suggesting mushrooms; reverse in yellow to orange red shades, surrounding agar pigmented in deep chrome shades penicilli strictly monoverticillate (Fig M1), bearing conidia in parallel chains forming loose columns up to 60 to 200 μ in length; sclerotia elliptical or subglobose, mostly 180 to 400 μ by 150 to 300 μ , conidiophores arising from the substratum or from aerial hyphae, seldom branched, smooth or nearly so walled, up to 80 to 200 μ in length by 19 to 24 μ , enlarging in terminal areas to vesicular apices 44 to 69 μ in diameter; sterigmata parallel in crowded cluster of 8 to 14, mostly 81 to 125 μ by 19 to 25 μ , with conidium bearing tips somewhat narrowed; conidia elliptical, mostly 23 to 31 μ by 19 to 2.7 μ , smooth or nearly so walled, and slightly roughen walls are shown by electron microscopy (Fig E-1) Colonies on steep agar slightly larger on Czapek, growing about 35 to 36 mm in 10 to 12 days at 25°C, 38 mm at 30°C, seldom growing at 37°C, reverse becoming reddish shades near Mahogany Red, the other characters as on Czapek

Strains of this species occurs soils

*van Beyma, FH Zentbl F Bakt II, 96 416 419, fig 1 and 2 1937

**Raper, KB, Thom, C and Fennell, DI, A Manual of the Penicillia, 160 163 1949

***Abbe S, J Gen Appl Microbiology p 49 1956

Fig. C-1 *Penicillium sclerotiorum* van Beyma, FAT 1181, on Czapek agar, 10 days

ノアヘック灰入培養に於ける集落の発育は 25°C に於て 5 日目約 15mm; 10 日目約 25mm (Fig C-1), 20 日目, 約 56 mm, 30°C, 10 日目約 30 mm; 37°C, 発育不能; 集落表面は鮮やかなオレンジ赤色の菌糸に覆われた菌核で殆んど全面を占め, 胞子形成部は局部的に散在し, 青灰色, 渗出物は豊富, 鮮赤色; 集落の裏面は黄色又はオレンジ赤色, 集落周辺寒入は黄又はオレンジ色; ヘニラス (*Penicillus*) は単輪生状 (Monoverticillate), (Fig M-1), 分生胞子連鎖は並行状, 又は幾分か円柱状, 長さ, 60~200 μ , 菌核楕円又は近球形, 180~400 μ ×150~300 μ ; 分生胞子柄は基質又は気菌糸より生育し, 80~200 μ ×19~24 μ , 先端膨大し 44~69 μ , 1 階, 殆んど分枝せず; 梗子, 8~14 枚, 並行状に群生, 81~125 μ ×19~25 μ , 先端多少細い, 分生胞子, 楕円, 23~31 μ ×19~27 μ , 平滑, 電子顕微鏡写真にては 0.1 μ 以下の微小の粗面 (Fig E-1)。

スティフ灰入培養にては 25°C, 5 日目約 17 mm, 10 日目 35~36 mm, 20 日目約 62 mm, 30°C, 10 日目約 38 mm, 37°C, 発育不能。

集落裏面赤色を呈して来る, 他の特性は同上。

亜硝酸灰入培養地にては発育不能。

本菌株は土壌中より得る。

- **2. *Penicillium thomii* Maire**



Fig. M-2. *Penicillium thomii* Maire, FAT 388, detail of Penicilli

1000X

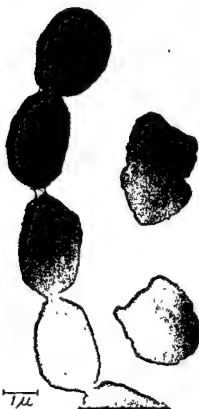


Fig E-2 *Penicillium thomii* Maire, FAT 388, con-
walls and the elliptical to

smooth or nearly so

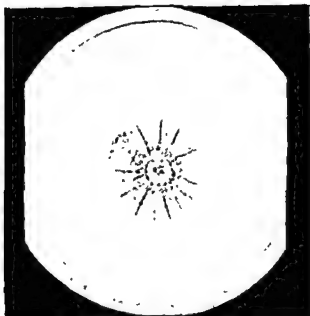


Fig. C-2. *Penicillium thomii* Maire. FAT 388, on Czapek agar, 10 days

ノアヘック大入培養にては 25°C, 5日11日約 19 mm, 10日11日約 37 mm (Fig C-2), 20日11日約 50 mm; 30°C, 10日11日約 54 mm, 37°C, 10日11日約 37 mm; 生菌表面は茶色の皺があり、菌糸はピロート状又は幾分か綿毛状、分枝胞子嚢生部は中心部又は局部的か或は僅かに全面にあり、母菌緑色、又は灰緑色を呈す、桃色或は黄又はオレンジ色の菌核は固く、長楕円又は球形、280~440 μ ×210~350 μ , 生菌全面又は局部的に形成し、屢々人工培地に長く保存する場合は形成不能になる。滲出物は或る菌核にては豊富、他菌核にては不形成、黄又は灰色、生菌表面は黄、粉、桃褐、赤褐色を呈し、生菌周辺へ入は黄褐色; ヘニラスはや輪生状 (Fig M-2)、分枝胞子嚢は幾分か円柱状、長さ、60~250 μ , 分枝胞子嚢は基生菌糸又は女頭菌糸より発育、知んと分離せず、極端作かの突起部面、100~400 μ ×28~36 μ , 先端膨大し 30~54 μ , 梗子7~10ヶ幾分か並行状に群り、75~10 μ ×18~26 μ , 先端幾分か細い、分枝胞子嚢楕円又は亜球形、25~35 μ ×15~28 μ , 平滑、先端微なり良 (Fig E-2) にても滑面、

スティーブズ大入培養にては 25°C 5日11日約 25 mm 10日11日約 45 mm 20日11日約 54 mm, 30°C 10日11日約 50 mm, 37°C, 10日11日約 38 mm, 他の諸性質同

歩菌酸大入培養にては良好な発育を示す

本菌種は土壌、水、及び腐敗果より分離される。

2 *Penicillium thomii* Maire

Colonies on Czapek agar growing rapidly in most strains attaining a diameter of about 37 mm in 10 to 12 days at 25°C (Fig C-2); 54 mm at 30°C; 37 mm at 37°C; (growing fairly well on NO_3 medium), conspicuously furrowed, velvety or sub-floccose texture, consisting of a tough basal felt with surface appearing loose to slightly floccose, white to pale blue-green, sporulating lightly throughout but more abundantly in central colony areas and in localized sectors, in gray-green shades near artmesia green, sometimes producing abundant, hard, rounded to oblong, pink or yellow, orange sclerotia up to 280 to 440 μ by 210 to 350 μ throughout the colony area, sometimes in limited sectors only, and often failing to develop sclerotia, especially in strains long maintained in artificial culture, exudate abundantly produced in some strains, yellow to orange shades not in others; odor slight, suggesting mushrooms; reverse in yellow or orange to pinkish brown shades with surrounding agar pale yellow pigmented; penicilli strictly monoverticillate (Fig M-2), bearing conidial chains usually in loose columns up to 60 to 250 μ in length, conidiophores arising from the basal felt and from interlacing aerial hyphae, seldom branched, with walls delicately echinulate, variable in length up to 100 to 400 μ by 28 to 36 μ with apices enlarged, somewhat vesicular about 30 to 54 μ in diameter, sterigmata loosely parallel, commonly 7 to 10 in the vertical, usually 75 to 10 μ by 18 to 26 μ with conidium bearing tips somewhat narrowed, conidia elliptical to subglobose, mostly 25 to 36 μ by 15 to 28 μ , smooth or nearly so walled, and the smooth or nearly so walls are shown by electron microscopy (Fig E-2)

Colonies on steep agar spreading broadly, about 45 mm or more in 10 to 12 days at 25°C, 50 mm. at 30°C, about 38 mm at 37°C, the other characters are as described above

Strains of this species occurs from wood, soils and diseased rice

*Maire R., Bul Soc Hist Nat Afrique du Nord 8 189-192 1917

**Thom, C., The Penicillia, P 173 1930, U S Dept Agr., Bur Anim Ind Bul 118 p 78 1910

***Raper K B Thom C and Fennell, D I. A Manual of the Penicillia 156 160 1949

****Abe, S., J Gen Appl Microbiology pp 50 51 1956

3. *Penicillium purpurescens* (Sopp) Raper, Thom and Fennell.



Fig. M-3A. *Penicillium purpurrescens* (Sopp) Raper, Thom and Fennell, FAT 732, low power view of colony section showing typically character of texture.



Fig. M-3B. *Penicillium purpurrescens* (Sopp) Raper, Thom and Fennell, FAT 832, detail of penicilli



Fig. E-3. *Penicillium purpurrescens* Sopp Raper, Thom and Fennell, FAT 559, conidia showing the conspicuously echinulate or verruculose walls and the globose to subglobose form

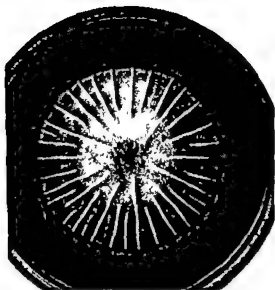


Fig. C-3. *Penicillium purpurescens* (Sopp) Raper, Thom and Fennell, FAT 732, on Czapek agar, 10 days.

ツァヘック寒天培養に於ける生落の発育は 25°C 5 日 23~34 mm, 10 日 50~70 mm (Fig C-3), 20 日 64~74 mm.; 30°C, 10 日 47~56 mm, 37°C, 発育不能, 或る菌株にては輪生状に発育, 放射状の斑があり, 菌叢はピロート状, 分生胞子着生部の呈色は暗又は濃青緑色或は青灰緑色, 分泌物は欠乏は僅小, 褐色又は赤色; 生落表面は濃赤色或は褐色, 生落周辺部は無色又は黄又は薄褐色, 分生胞子柄は殆んど基質より直立し (Fig M-3A), 60~250 μ \times 21~35 μ , 先端幾分か膨大し 31~50 μ , 平滑, ヘニシラスは単輪生状で, 略として分岐し, 分生胞子連鎖は幾分か円柱状, 長さ 60~280 μ , 梗子, 5~13ヶ鋭点或は幾分か鋭点に群生, 屢々分生胞子柄頂端の下部に着生, 7~13 μ 又は 15 μ \times 21~35 μ (Fig M-3B), 分生胞子球形又は亜球形, 2.5~4.6 μ \times 5.5 μ , 著しい粗面, 又電子顕微鏡写真 (Fig E-3) にても著しい刺状又は疣状を呈す。

スティープス寒天培養に於ける, 25°C の生落の発育は 5 日 32~36 mm, 10 日 60~82 mm, 20 日 72~82 mm, 30°C, 10 日 57~62 mm, 37°C, 発育不能, 他の諸特性は同上。

希硝酸寒天培地にてはや、発育良好である。

本菌株は屢々土壤, 朽木, 土壤腐敗物等より分離される。

3. *Penicillium purpurescens* (Sopp) Raper, Thom and Fennell

Colonies on Czapek agar attaining a diameter of 50 to 70 cm. in 10 to 12 days at 25°C, 47 to 56 mm at 30°C, seldom grew at 37°C, (growing fairly well or slightly sporulating on NO₂-medium), conspicuously zonate in some strains, almost azonate in others, radiately wrinkled, velvety or nearly so, conidial areas in dark blue green or dark bluish gray green, and dark olive green shades, exudate lacking to limited, light amber to reddish, odor indefinite, reverse in Brazil Red or Brown shades, surrounding agar uncolor to yellow or pale pink (Fig C-3); conidiophores generally arising in a close stand directly from the substratum (Fig M-3A) mostly 60 to 250 μ long by 21 to 35 μ in diameter, smooth or nearly so walled, enlarging somewhat at the apices to 31 to 50 μ ; penicilli strictly monoverticillate as a rule, sometimes branched, bearing chains of conidia in loose columns up to 60 to 280 μ long, sterigmata mostly in groups of 5 to 13, crowded in the verticil, compact or loosely compact, often arising low on the sides of the vesicular area, 7 to 13 μ or 15 μ by 21 to 35 μ (Fig M-3B), conidia globose to subglobose, mostly 2.5 to 4.6 μ , some larger up to 5.5 μ , conspicuously roughed walled, and conspicuously echinulate or verruculose walls are shown by electron microscopy (Fig E-3)

Colonies on steep agar about 60 to 82 mm in diameter in 10 to 12 days at 25°C, predominantly velvety, the other characters are as described above

Strains of this species are occasionally isolated from soil or contaminated materials and disease rice

* Sopp, O. Monogr. p p 117-119, Taf XIV, fig 102

Taf XXII, fig 4 1912

** Thom, C. The Penicillia p 179 1930

*** Raper, K. B., Thom, C. and Fennell, D. I., A Manual of the Penicillia, p p 177-180 1949

**** Abe, S., J. Gen. Appl. Microbiology, p p 52-53



4. *Penicillium spinulosum* Thom.



Fig. M-4 A. *Penicillium spinulosum* Thom, FAT, 621, low power view of colony section showing typically velvety character of texture.

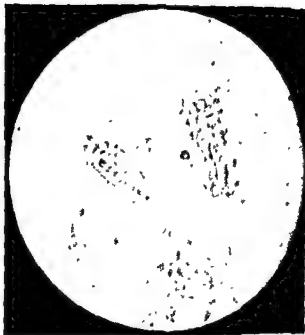


Fig. M-4 B. *Penicillium spinulosum* Thom, FAT 621, detail of penicilli

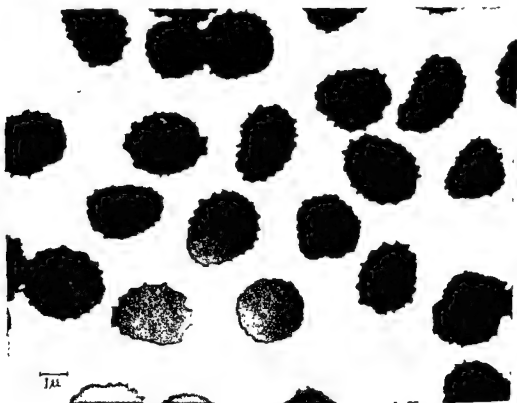


Fig. L-4 *Penicillium spinulosum* Thom FAT 1137, conidia showing the spinulose walls and the globose to subglobose form

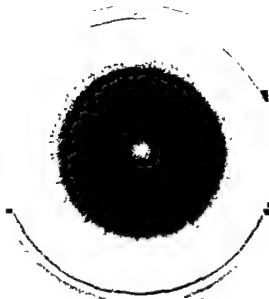


Fig C-4. *Penicillium spinulosum* Thom, EAT 621, on Czapek agar, 10 days

ソアヘック寒天培養の生落の発育は25°Cにて、5日目28~45 mm.; 10日目、66~76 mm (Fig C-4); 20日目75~80 mm; 30°C, 10日目50~72 mm; 37°C, 発育不能; 菌叢、ピロート状、(Fig M-4A)又は類似、或る菌株にては綿毛(羊毛)状、舞状、乳落表面平滑又は放射状の皺があり、時として頭髪状の皺があり、約10~30 mmの白色の周辺部を有し、中心部の高さは700~1000 μ で或る菌株は胞子の着生が多く、又或る菌株は僅小であり、分生胞子着生部は略又はくすんだ緑色であり、濃黄緑色、濃青緑色で順次スリーブ色を呈す; 滲出物は欠或は非常に僅小、無色; 生落表面は無色又は薄黄、桃色で15~30日目は屢々紫色を呈し、生落周辺寒天は無色; ヘニノラスは單輪生状 (Fig. M-4B); 分生胞子柄はその直立場所により各種で、60~380 μ ×18~39 μ , 頂端部膨大し30~50又は8.4 μ , 多くの菌株は平滑、或る菌株にては僅小の斑点状粗面、梗子は6~10ヶ細胞に群生し、7.9~11.4 μ 又は13 μ ×2.0~3.1又は3.7 μ , 分生胞子、球形又は亞球形、2.1~3.2又は4.0 μ , 小刺状粗面 (Spinulose), 又は電子顕微鏡写真 (Fig E-4) にも小刺状粗面、分生胞子連鎖は円柱状、又は類似、長さ60~230 μ .

スティープ寒天培養に於ける生落の発育は25°Cに於て5日目28~50 mm, 10日目65~80 mm, 20日目75~80 mm, 30°C, 10日目55~79 mm, 37°C, 発育不能, 他の諸特性は同上。

亜硝酸寒天培養に於ては良好な発育を示す

本菌種は土壌又は乾燥物より分離さる。

4. *Penicillium spinulosum* Thom

Colonies on Czapek agar growing fairly rapidly or broadly, 66 to 76 mm. in 10 to 12 days at 25°C (Fig. C-4); 50 to 72 mm at 30°C; seldom growing at 37°C; (growing very well on NO₂ medium), usually typically velvety or velutinous (Fig M-4A), floccose or funiculose textured in some strains; smooth or radial furrowed, sometimes cerebriform furrowed, white margin 10 to 30 mm wide; colony depth 700 to 1000 μ in central area, heavily sporing in some strains, lightly in others, in dark or dull green shades near Dusky Yellowish Green, Dark American Green, Dark Russian Green, becoming similar or olive green shades; odor very faint; exudate lacking or very limitedly, colorless; reverse colorless or pale yellow, pinkish shades, becoming occasionally violet shades near Violet Slate or Deep Slate Violet in 15 to 30 days, with surrounding agar seldom pigmented, penicilli strictly monoverticillate bearing spore chains in columns or loosely columns up to 60 to 230 μ long (Fig M-4B); conidiophores varying in relation to their origin, mostly 60 to 380 μ long by 18 to 39 μ , with apices vesicular up to 30 to 50 or 8.4 μ in diameter, with walls almost smooth or nearly so in some strains to slightly punctate in others, sterigmata comparatively few in the verticil, about 6 to 10, compact, measuring mostly 7.9 to 11.4 or 13 μ by 2.0 to 3.7 μ , acute type with smooth or nearly so walls; conidia globose to subglobose, mostly 2.1 to 3.2 or 4.0 μ in diameter, with spinulose walled, and also spinulose walls are shown by electron microscopy (Fig E 4).

Colonies on steep agar growing more rapidly, about 65 to 80 mm in 10 to 12 days at 25°C; 55 to 79 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek

Strains of this species are isolated from soils and drying persimmon

* Thom, C. U S Dept Agr, Bur Annu Ind Bul 118, p 76, fig 32, 1910, The Penicilla p p 183-184, fig 21 1930

** Raper, K.B., Thom C and Fennell D.I., A Manual of the Penicilla, p p 180 185 1949

*** Sakaguchi, K., Japanese Assoc. of Adv Sci No 6 726 739 1930

**** Abe, S., J Gen Appl Microbiology p 53 1956



Fig. M-4 A. *Penicillium spinulosum* Thom, FAT, 621, low power view of colony section showing typically velvety character of texture



Fig. M-4 B. *Penicillium spinulosum* Thom, FAT 621, detail of penicilli

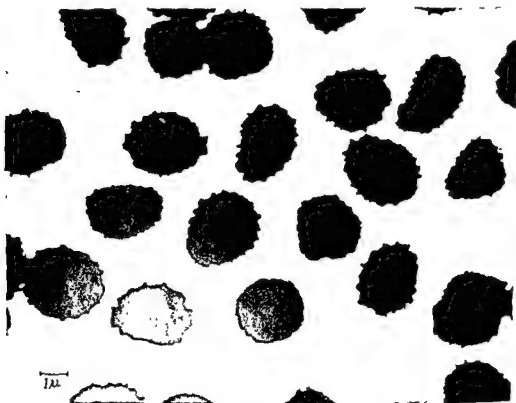


Fig. I-4. *Penicillium spinulosum* Thom FAT 1137, conidia showing the spinulose walls and the globose to subglobose form



Fig. C-4. *Penicillium spinulosum* Thom, EAT 621, on Czapek agar, 10 days

ノアヘ、クアズ培養の集落の発育は25°Cにて、5日目28~45 mm、10日目、66~76 mm (Fig C-4); 20日目75~80 mm、30°C、10日目50~72 mm; 37°C、発育不能; 菌叢、ピロート状、(Fig. M-4A) 又は類似、或る菌株にては綿毛(毛毛)状、繩状、集落表面平滑又は放射状の皺があり、時として頭脳状の皺があり、約10~30 mmの白色の周辺部を有し、中心部の高さは700~1000 μ で成る菌株は胞子の着生が多く、又或る菌株は僅小であり、分生胞子着生部は暗又はくすんだ緑色であり、濃黄緑色、濃青緑色で順次ナリーブ色を呈す; 分泌物は欠或は非常に僅小、無色; 集落表面は無色又は薄黄、純色で15~30日目は層々紫色を呈し、集落周辺部又は無色; ヘミノラスは単輪生状 (Fig M-4B)、分生胞子柄はその直立場所により各種で、60~380 μ ×18~39 μ 、頂端部膨大し30~50又は84 μ 、多くの菌株は平滑、或る菌株にては僅小の斑点状粗面、梗足は6~10ヶ極端に群生し、79~114 μ 又は13 μ ×20~31又は37 μ 、分生胞子、球形又は亜球形、21~32又は40 μ 、小刺状粗面 (Spinulose)、又は電子顕微鏡写真 (Fig E-4) にても小刺状粗面、分生胞子連鎖は円柱状、又は類似、長さ60~230 μ

スティープ寒天培養に於ける集落の発育は25°Cに於て5日目28~50 mm、10日目65~80 mm、20日目75~80 mm、30°C、10日目55~79 mm、37°C、発育不能、他の諸特性は同上。

亜硝酸寒天培養に於ては良好な発育を示す。

本菌株は土壌又は乾燥柿より分離さる。

4. *Penicillium spinulosum* Thom

Colonies on Czapek agar growing fairly rapidly or broadly, 66 to 76 mm in 10 to 12 days at 25°C (Fig C-4), 50 to 72 mm. at 30°C; seldom growing at 37°C, (growing very well on NO_3 medium), usually typically velvety or velutinous (Fig. M-4A), floccose or funiculose textured in some strains; smooth or radial furrowed, sometimes cerebriform furrowed, white margin 10 to 30 mm. wide; colony depth 700 to 1000 μ in central area, heavily sporing in some strains, lightly in others, in dark or dull green shades near Dusky Yellowish Green, Dark American Green, Dark Russian Green, becoming similar or olive green shades, odor very faint; exudate lacking or very limitedly, colorless; reverse colorless or pale yellow, pinkish shades, becoming occasionally violet shades near Violet Slate or Deep Slate Violet in 15 to 30 days, with surrounding agar seldom pigmented; penicilli strictly monoverrucate bearing spore chains in columns or loosely columns up to 60 to 230 μ long (Fig M-4B), conidiophores varying in relation to their origin, mostly 60 to 380 μ long by 18 to 39 μ , with apices vesicular up to 3.0 to 5.0 or 8.4 μ in diameter, with walls almost smooth or nearly so in some strains to slightly punctate in others; sterigmata comparatively few in the verticil, about 6 to 10, compact, measuring mostly 7.9 to 11.4 or 13 μ by 2.0 to 3.7 μ , acute type with smooth or nearly so walls, conidia globose to subglobose, mostly 2.1 to 3.2 or 4.0 μ in diameter, with spinulose walled, and also spinulose walls are shown by electron microscopy (Fig E-4)

Colonies on steep agar growing more rapidly, about 65 to 80 mm in 10 to 12 days at 25°C, 55 to 79 mm at 30°C; seldom growing at 37°C, the other characters as on Czapek

Strains of this species are isolated from soils and drying persimmon.

* Thom, C, U S Dept Agr, Bur Anim Ind Bul 118, p 76, fig 32, 1910, The Penicillia, p p 183 184, fig 21 1930

** Raper, K B, Thom, C and Fennell D L, A Manual of the Penicillia, p p 180 185 1949

*** Sakaguchi, K, Japanese Assoc of Adv Sci No 6 726 739 1930

**** Abe, S, J Gen Appl Microbiology p 53 1956

5. *Penicillium lilacino-echinulatum* Abe

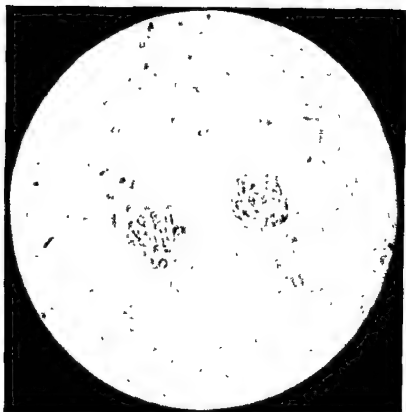


Fig. M-5. *Penicillium lilacino echinulatum* Abe, FAT 84, detail of penicilli

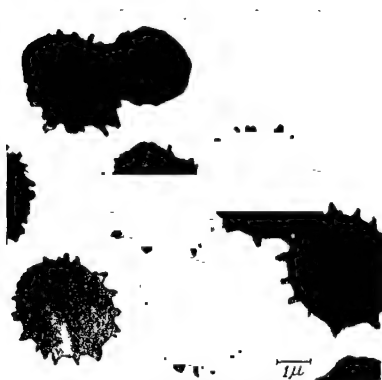


Fig. L-5. *Penicillium lilacino echinulatum* Abe, FAT 81 conidia showing the conspicuously echinulate or verruculose walls and the globose to subglobose form

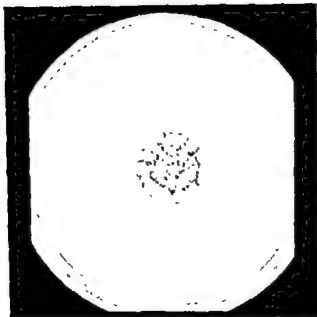


Fig. C-5. *Penicillium lilacino-echinulatum* Abe. FAT 84, on Czapek agar, 10 days

ツァヘック大天培養に於ける集落の発育は 25°C, 5 日目約 16 mm, 10 日目約 30 mm (Fig C-5), 20 日目約 42 mm; 30°C, 10 日目約 37 mm; 37°C, 発育不能, 集落表面に溝があり中心部隆起, 菌糸は縄状, 分生孢子着生部は薄灰青緑色又はオリーブ灰色; 分泌物は豊富, 無色, 集落表面は 6~7 日藍色順灰黄色を呈し, 周辺部は薄黄色, ヘニシラスは半輪生状 (Fig. M-5); 分生孢子柄 20~40 μ × 12~19 μ , 平滑, 頂端膨大, 30~62 μ , 梗子柄部に 6~15 分生, 50~70 μ 又は稀に 93 μ × 15~25 μ , 平滑面, 分生孢子球形又は亜球形, 大刺又は疣状突起粗面, 21~28 μ , 分生孢子産頭は並行状又は幾分か円柱状, 長さ 30~60 μ ; 分生孢子的電子顕微鏡写真 (Fig. E-5) も著しい大刺又は疣状突起粗面。

スティープ大天培養に於ける 25°C の集落発育は 5 日目約 13 mm, 10 日目約 37 mm, 20 日目約 54 mm 30°C, 10 日目約 40 mm, 37°C, 発育不能, 他の諸特性同上。

並硝瓶大天培養にては発育不能,

本菌株は土壌より分離さる。

5 *Penicillium lilacino-echinulatum* Abe.

Colonies on Czapek agar rather restrictedly, about 30 mm in 10 to 12 days at 25°C; 37 mm. at 30°C; seldom growing at 37°C; (growing little or not on No₂-medium), the central area is raised, and sulcate, the surface appearing typically funiculose, in pale gray green shades near Mineral Gray or Pale Olive Gray, changing to Tea Green, with a white margin 0.2 to 0.5 mm in wide (Fig C-5); exudate abundant, colorless, reverse in near Light Vinaceous Lilac in 6 to 7 days, changing to yellow shades, and the surrounding agar in pale yellow shades; penicilli strictly monoverticillate (Fig M-5), conidiophores short, up to 20 to 40 μ in length by 12 to 19 μ in diameter, with walls smooth or nearly so, and apices enlarged up to 30 to 62 μ in diameter, sterigmata in crowded clusters, compact, numbering 6 to 15 in a verticil, mostly 50 to 70 μ or rarely 93 μ in length by 1.5 to 2.5 μ in diameter, acute type with smooth walls or nearly so; conidia globose to subglobose, with typically echinulate or verruculose walls 21 to 28 μ in diameter; chains of chaidia in parallel or loose columns, commonly up to 30 to 60 μ in length, and conidia showing conspicuously echinulate or verruculose walls in electron microscopy (Fig E-5)

Colonies on steep agar are restricted, growing to about 37 mm in 10 to 12 days at 25°C, 40 mm at 30°C, seldom growing at 37°C, the other characters are as described above

Strains of this species are isolated from soils in Japan

*Abe S. J Gen Appl Microbiology p 54 1956



6. *Penicillium frequentans* Westling.



Fig. M-6A. *Penicillium frequentans* Westling, FAT 627, low power view of colony section showing velvety character of texture.



Fig. M-6B. *Penicillium frequentans* Westling, FAT 627, detail of penicilli

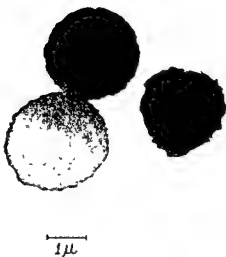


Fig. E-6 *Penicillium frequentans* Westling, FAT 103, conidia showing the slightly rough walls and the globose to subglobose form

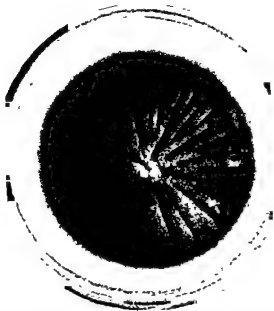


Fig. C-6. *Penicillium frequentans* Westling, FAT 627, on Czapek agar, 10 days

ノアヘック寒天培養に於ける集落の発育は25°Cにて5日目20~40 mm; 10日目59~75 mm. (Fig C-6); 20日目70~80 mm; 30°C, 10日目47~64 mm; 37°C, 発育不能, 菌叢はヒロード状 (Fig M-6A) 又は類似, 或は菌株により塊状, 集落表面は平滑又は放射状の皺があり, 或る菌株にては中心部が隆起, 分生胞子着生部は暗灰色或は黄緑色或は黄褐色を呈し, 14日又は灰サリーブ色を呈し, 集落内周部は10~20 mm 幅 白色; 集落裏面は黄橙, 褐色, 時々紫褐色, 集落周辺部又は無色或は薄黄, 灰色, ペニシラスは単輪生状 (Fig M-6B), 分生胞子柄; 着生部により異なる, 40~400 μ \times 2.5~3.6 μ 又は4.3 μ , 頂端部膨大, 32~50 μ 又は85 μ , 滑面, 梗子5~14カ短密に群生し, 84~12 μ \times 21~40 μ , 分生胞子連鎖, 円柱状, 長さ, 60~380 μ 或は以上, 分生胞子, 球形又は亜球形 2.1~3.8 μ , 滑面, 又電子顕微鏡写真 (Fig E-6) にては0.1 μ 以下の倍小の相面。

ステップ寒天培養 25°C 5日目の集落の発育は25~47 mm, 10日目63~77 mm, 20日目76~84 mm, 30°C 10日目, 57~71 mm, 37°C 発育不能, ノアヘック寒天培養より一層分生胞子着生多く且つ集落表面も一層濃い白色を示し, 他の諸特性は同上。亜硝酸寒天培養にては発育不能。

本菌種は腐敗野菜, 乾燥物, 土壌等より分離され, ヘニリュム紙中最も分布の広範囲の菌種の一つである。

6. *Penicillium frequentans* Westling

Colonies on Czapek agar rather broadly, 59 to 75 mm in 10 to 12 days at 25°C, 47 to 64 mm. at 30°C; seldom growing at 37°C; (growing little or not on NO₂-medium); usually typically velvety or velutinous textured (Fig M-6A) funiculose in some strain, smooth or radiately wrinkled in most strains, central area is raised in some strains, in dark bluish green or dark yellow green shades near Dark Russian Green, Dark American Green, Dusky Yellowish Green, becoming similar or grayish olive shades, with a white margin about 10 to 20 mm. in wide (Fig C-6), exudate lacking or limitedly, clear to light brown, odor faint, moldy; reverse mostly in shades of yellow-orange near Mars Yellow to Xanthine Orange, Amber Brown, but in occasional strains appearing light purplish brown and the surrounding agar colorless or pale yellow or pinkish shades; penicilli strictly monoverticillate (Fig M-6B), conidiophores varying in relation to their origin, mostly 40 to 120 to 400 μ in length by 2.5 to 3.6 or 4.3 μ , with apices vesicular up to 32 to 50 or 85 μ in diameter, with smooth or nearly so walled, sterigmata in compact clusters numbering 5 to 14 in the vertical, mostly 84 to 120 μ by 21 to 40 μ , commonly producing chains of conidia in fairly well defined columns up to 60 to 380 μ or more in length, conidia globose to subglobose mostly 2.1 to 3.8 μ with smooth or nearly so walled, and slightly rough walls are shown by electron microscopy (Fig E-6)

Colonies on steep agar slightly larger than on Czapek, growing about to 63 to 77 mm. in 10 to 12 days at 25°C, 57 to 71 mm at 30°C, seldom growing at 37°C, heavily sporing, color in reverse deeper and somewhat more intense than on Czapek, the others characters as on Czapek

Strains of this species are isolated from soils and decaying vegetable matter, drying materials, and represents one of the most abundant and widely distributed of all the *Penicillia*

- * Westling, R. Arkiv for Botanik II 53, 133 134, figs. 39, 78 1911
- ** Bourge, Ph., La Cellule, 33 Fasc. I, pp 292 293, Col Pl X and Pl XVII, fig 99 1923
- *** Thom, C. The Penicillia pp 216 217 1930
- **** Raper, K. B., Thom, C. and Fennell, D. I. A Manual of the Penicillia pp 172 177 1945
- ***** Abe, S. J Gen Appl Microbiology 55 56 1954

7. *Penicillium citreo-viride* Biourge

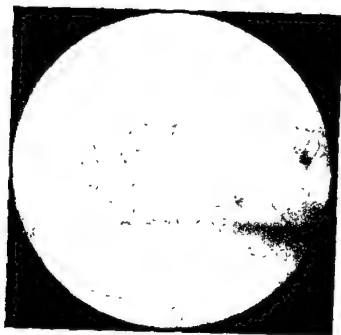


Fig. M-7A. *Penicillium citreo-viride* Bource, FAT 970, detail of penicilli

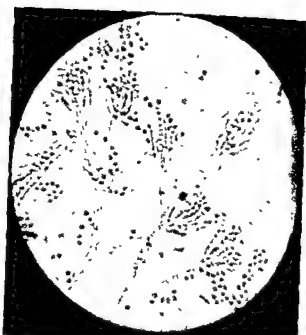


Fig. M-7B. *Penicillium citreo-viride* Bource, FAT 568, low power view of colony section showing typically velvety character of texture

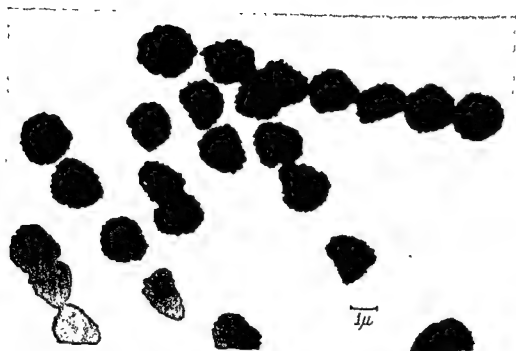


Fig. E-7. *Penicillium citreo-viride* Bource, FAT 959, conidia showing the slightly rough walls and the globose to subglobose form

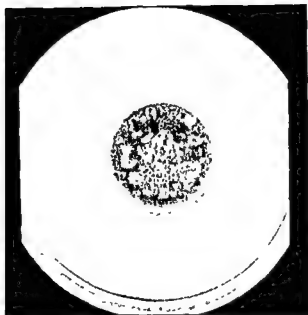


Fig C-7. *Penicillium citreo-viride* Biourge, FAT 970, on Czapek agar, 10 days

7. *Penicillium citreo-viride* Biourge

Colonies on Czapek agar rather restrictedly spreading, attaining a diameter of 20 to 36mm in 10 to 12 days at 25°C (Fig C-7); 22 to 37 mm at 30°C, seldom growing at 37°C; (growing very well on NO₂ medium), surface appearing typically velvety or velutinous (Fig M-7A) and the other strains subfloccose, floccose or funiculose textured, plane or smooth, strongly wrinkled and buckled, vegetative hyphae delicate and yellow in color, with a white or pale yellow margin, 0.2 to 1.5 mm in wide; conidial areas in color typical bluish green, dark bluish green, yellowish green, bluish gray green shades, exudate limitedly or abundantly, pale or strongly bright yellow shades; odor slight, moldy; reverse and agar in bright yellow shades, light or strongly, penicilli strictly monoverticillate (Fig M-7B), occasionally showing prolongation of the main axis, or with 1 or 2 branches from lower nodes producing secondary verticils of sterigmata; conidiophores arising from substratum, occasionally or sometimes from trailing and branching hyphae, mostly 30 to 60 or 90 μ in length by 12 to 30 μ in diameter, with apices 23 to 38 μ in diameter, smooth or nearly so walled, sterigmata compact clusters of 4 to 12, mostly 68 to 94 μ by 12 to 25 μ , acute type, conidia globose to subglobose, mostly 12 to 22 or larger 30 μ in diameter, smooth or nearly walls, and the slightly walls (spines less than 0.1 μ) are shown by electron microscopy (Fig E-7), conidial chains loosely parallel or column, mostly up to 30 to 100 μ in length.

Colonies on steep agar somewhat larger than on Czapek, about 26 to 45 mm, in 10 to 12 days at 25°C, 24 to 41 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek.

Strains of this species occurs from soils and disease rice or other materials. And the species widely distributed in nature. It is apparently able to grow under conditions of limited moisture and nutrients that would exclude many faster growing species.

(*Penicillium toxicarium* Miyake duplicate almost exactly as given above)

*Biourge, Ph., Monograph, La Cellule 33, fasc 1 p 229, Col PL IX and Pl XV, fig 88 1923

**Thom, C., The Penicillia, pp 199 200 1930

***Raper, K B., Thom C and Fennell, D I., A Manual of the Penicillia PP 215 218 1949

****Miyake, I., Naito H and Tanoda, H., Report of Rice Utilization Lab Japan No 1 1940

*****Abe, S., J Gen Appl Microbiology 57 58 1956.

ソッヘック大入培養に於ける集落の発育は 25°C にて 5日目に 11~20mm, 10日目に 20~36mm (Fig C-7) 20日目に 34~56mm; 30°C 10日目に 22~37mm, 37°C 発育不能, 菌叢はビロード状又は類似 (Fig M-7A), 或は菌株により縮み状又は繩状, 集落表面は平面又は平滑或は著しい皺, 又はより上った形状をなし, 菌叢は黄色, 集落円周部は 0.2~1.5mm 中, 白色, 分生胞子着色部は青緑, 黄緑, 黄緑, 青灰緑色, 滲出物は作小又は豊富, 弱又は著しい輝黄色, 集落表面及び集落周辺部又は寄輝黄色又は薄黄色, ヘニラスは半輪状, (Fig M-7B) 短々分枝, 分生胞子柄は革質又は細筒状, 分枝状菌糸より発育, 30~90 μ × 12~30 μ , 菌頭膨大, 23~38 μ , 滑面, 梗子 4~12 根部に群生, 68~94 μ × 12~25 μ , 分生胞子 球形 又は亜球形, 12~22 μ , 人, 30 μ , 滑面, 電子顕微鏡写真 (Fig E-7) には 0.1 μ 以下の微小粗面, 分生胞子連鎖, 幾分並行状, 円柱状, 長さ 30~100 μ

スティーブ大入培養にての集落の発育は 25°C, 5日目に 11~21mm, 10日目に 26~45mm, 20日目に 40~55mm, 30°C, 10日目に 24~41mm, 37°C, 発育不能, 他の諸性質は同上。

亜硝酸大入培養にては良好なる発育を示す。

本菌叢は非常に広範囲の分布を示し, 作小の湿度, 酸素条件でも発育, 生存が可能で土壌, 飼料, 他多くの試料より分離する。

8. *Penicillium vinaceum* Gilman and Abbott

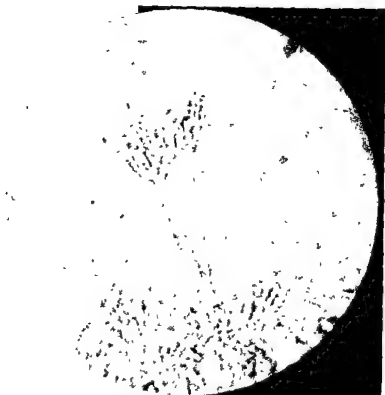


Fig. M-8. *Penicillium vinaceum* Gilman and Abbott, FAT 1291, detail of penicilli

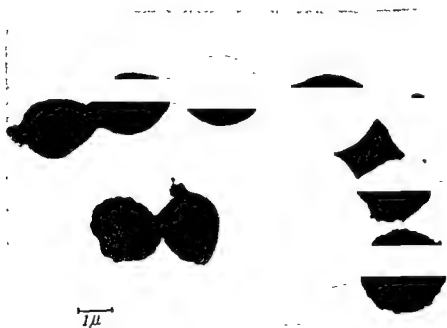


Fig. E-8. *Penicillium vinaceum* Gilman and Abbott, FAT 1291, conidia showing the smooth or nearly so walls and the ovate to subglobose form

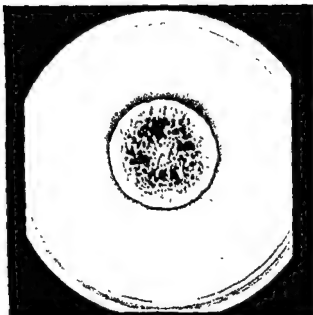


Fig. C-8A *Penicillium vinaceum* Gilman and Abbott, FAT 1291 on Czapek agar, 10 days

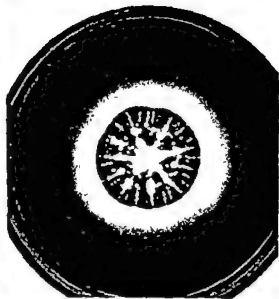


Fig. C-8B *Penicillium vinaceum* Gilman and Abbott, FAT 1291, on steep agar, 10 days

ノアヘック寒天培養に於ける集落の発育は 25°C にて 5 日目約 18 mm, 10 日目約 33 mm (Fig C-8A), 20 日目約 50 mm.; 30°C, 10 日目約 40 mm., 37°C, 発育不能。集落表面は著しい放射状の皺があり、厚み、10~12 mm, 集落円周部は急激に高くなっている、又その中は約 20 mm; 菌叢は縄状或は綿毛状、分生胞子着生は少なく、群灰緑色; 滲出物は豊富、層々大型の水滴、何又は濃い桃紫色(本菌の特性)、集落表面は桃紫色又は桃紫灰色、集落周辺寒天は同一様色調呈色、分生胞子柄は殆んど気菌糸より生育し、短く、20~60 μ \times 1.2~1.9 μ , 頂端は 2 l~3 l μ , 滑面、殆んど分枝せず、時々散開型の分枝を作る、ヘニシラスは車輪生状 (Fig M-8), 梗子 3~7 カ幾分か散開型に群生、60~87 μ \times 1.4~2.5 μ , 先端細い、分生胞子卵形又は卵球形、端が時々尖っている、2 l~2.8 μ , 層々 30 μ , 滑面、又電子顕微鏡写真 (Fig E-8) にても滑面、分生胞子連鎖、縄状、長さ 30~90 μ

スティーブ寒天培養にては 25°C の集落の発育は 5 日目約 20 mm, 10 日目約 34 mm (Fig C-8B) 20 日目約 54 mm., 30°C 10 日目約 27 mm., 37°C, 発育不能; 集落表面及び滲出物はノアヘック寒天培養より一層濃い紫色 胞の諸特性は同上。

亜硝酸寒天培養に於ては幾分か発育。
本菌株は 1 頃より分離さる。

8. *Penicillium vinaceum* Gilman and Abbott Colonies on Czapek agar growing rather

60 to 87 μ by 1.4 to 2.5 μ , with apices narrowed,

walls are shown by electron microscopy (Fig E-8), conidial chains tangled, up to 30 to 90 μ in length

Colonies on steep agar about 34 mm in 10 to 12 days at 25°C (Fig C-8B), 27 mm at 30°C, seldom growing at 37°C, essentially as above generally showing more vinaceous purple or darker in reverse and exudate, conidial structures as described above

Strains of this species occurs from soils

*Gilman, J.C. and Abbott, E.V. Iowa State College Jour Sci 1 299 fig 34 1927

**Thom, C. The Penicillia pp 195 196, fig 23 1930

***Raper, K.B., Thom, C. and Fennell, D.I., A Manual



Fig. M-D. *Penicillium multicolor* G.M. and P. FAT 1051, detail of penicilli

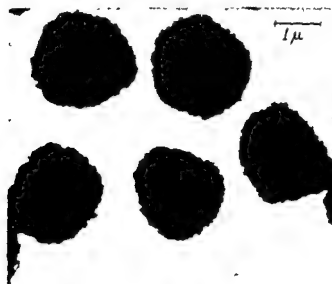


Fig. E-D. *Penicillium*
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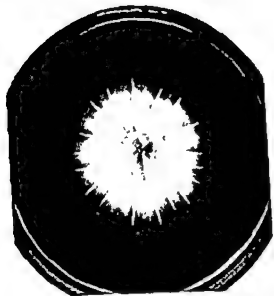


Fig C-9 *Penicillium multicolor* G-M and P. FAT 1051 on Czapek agar, 10 days

ツァヘグバ入培養に於ける発育は 25°C にて 5 日
 目、14~18 mm, 10 日目 23~45 mm (Fig C-9),
 20 日目 46~70 mm, 30°C, 10 日目, 24~45 mm;
 37°C 発育不能, 集落表面は放射状の皺があり, 生落
 円周部は黄或は棕色の呈色, 約 10~20 mm 巾 (本
 菌の特性), 菌叢ピロート状又は短臥, 或る菌株にては
 中心部に分生胞子が先づ着生し順次生落円周に向って
 着生して行く (稀し, ピロート状); 分生胞子着生部
 は全面的か又は中心部から中巾部 (中位部) に局部
 的に着生, 濃青緑色, 黒緑色, 濃青秋緑色, 産出物は
 塊, 或は作小, 黄又は薄橙, 褐色, 集落表面は鮮黄色
 或は橙, 褐, 褐色, 生落円周部人は 10~20 mm
 巾, 黄又は黄褐色, ヘニラスは単輪生状 (Fig M-
 9), 分生胞子柄は殆んど垂直より直立し, 又時として
 気糸弁より生育す, 分枝せず, 40~190 μ × 20~37 μ ,
 頂端膨大, 37~75 μ , 滑面, 乾燥除殻 (dry mount-
 ing) にて時々横壁に棕色の結晶様塊が見る, 径 5
 6~14 カ幾分か並行状或は縦糸に群生, 8.1~10.6 μ 或
 は 17.5 μ × 2.1~3.5 μ , 分生胞子産物は幾分か並行状,
 又は円柱状, 長さ, 60~190 μ , 分生胞子, 球形, 卵形
 又は球形, 1.8~3.1 或は 37 μ , 滑面, 又或は顕微
 鏡下 (Fig E-9) にては突起 0.1 μ 以下の僅小の粗
 面。

スティブス入培養にての集落の発育は 25°C にて 5
 日目 17~26 mm, 10 日目, 33~48 mm, 20 日目 58~
 73 mm, 30°C, 10 日目 38~55 mm; 37°C 発育不
 能 他の菌特性は同上。

亜硝酸入培養にては発育不能,

本菌株は土壌及び敗敗物より数多く分離さる。

9. *Penicillium multicolor* Gregorieva-Manoilova and Poradielova.

Colonies on Czapek agar rather restrictedly, about 23 to 45 mm in 10 to 12 days at 25°C (Fig C-9); 24 to 25 mm at 30°C, seldom growing at 37°C; (growing little or not on NO₂ medium, especially); radially furrowed, texture velvety or velutinous, with yellow or orange margin about 10 to 20 mm in wide (some strain conidial areas usually appears at first in the center and gradually extends towards the broad margin with abundant orange-red mycelia), conidial areas developing in localized central to sub-central patches against a background of yellow to orange or orange red vegetative mycelium in some strains, in others heavily sporing throughout with the massed conidial structures characterizing the colony, in blue-green shades near Dark Bluish Gray Green, Dark Russian Green, Dull Blackish Green; exudate lacking or limitedly, yellow or pale orange, brown shades; odor not pronounced, suggesting mushroom; reverse in bright yellow or orange shades near Orange Refuse, Chert, or Ground, or P. 1051.

(Fig. M-9), conidiophores arising from the substratum, but sometimes from aerial hyphae, usually unbranched, varying in length 40 to 190 μ by 20 to 37 μ , with apices enlarged up to 37 to 75 μ in diameter, smooth or nearly so walled, walls sometimes studded with orange colored crystals when view dry, sterigmata usually 6 to 14 in the verticil, loosely parallel or compact, mostly 81 to 106 or 175 μ by 21 to 35 μ , acute type, bearing chains up to 60 to 190 μ in length, loosely parallel or columns; conidia globose to ovate or subglobose, about 18 to 31 or 37 μ in diameter with walls appearing smooth or nearly so, and the slightly rough walls (spines less than 0.1 μ) are shown by electron microscopy (Fig E-9).

Colonies on steep agar growing more rapidly than on Czapek, up to 33 to 48 mm in 10 to 12 days at 25°C; 28 to 55 mm at 30°C; seldom growing at 37°C, the other characters as on Czapek.

Strains of this species occurs soils and other deteriorating materials.

* Grigorieva Manoilova, O C and Poradielova, N. N. Archives des Sciences Biologiques, Leningrad 19, 117-131, fig 1 and one plate with photograph 1-6 1915

** Thom, C. The Penicillia pp 212 213. 1930.

*** Raper, K B, Thom, C and Fennell, D I, A Manual of the Penicillia pp 198 201 1949

**** Abe, S, J Gen. Appl Microbiology pp 59-60 1956.

10. *Penicillium trzebinskii* Zaleski.

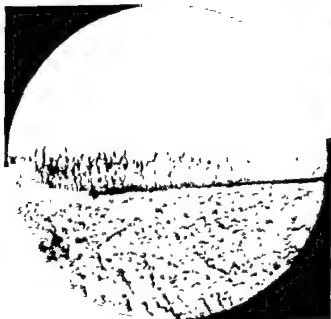


Fig. M-10A. *Penicillium trzebinskii* Zaleski, FAT 631, low power view of colony section showing typically velvety character of texture.



Fig. M-10B. *Penicillium trzebinskii* Zaleski, FAT631, detail of penicilli

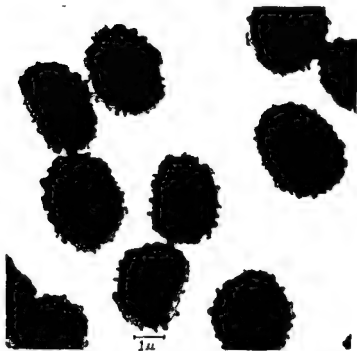


Fig. E-10 *Penicillium trzebinskii* Zaleski, FAT 631, conidia showing the echinulate or verruculose walls and the elliptical or ovate to subglobose form

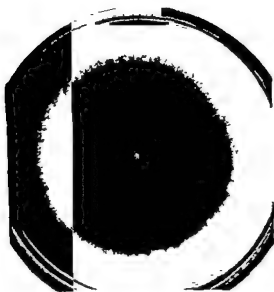


Fig. C-10. *Penicillium trzebinskii* Zaleski, FAT 631 on Czapek agar, 10 days

ノアヘック大気培養に於ては生落の発育は 25°C にて 5 日 14~18 mm; 10 日 53~70 mm (Fig C-10) 20 日 11, 約 80 mm; 30°C, 10 日 14~55 mm; 37°C, 発育不能, 菌叢ピロート状 (Fig M 10 A) 又は類似, 生落表面, 平滑又は放射状皺, 生落円周部は約 15 mm; 白色; 分生胞子着生部は灰緑色又は濃青緑色, 分泌物は久又は僅小, 薄褐色, 生落表面湿やかにくすんだ灰色又は暗褐色, 生落円周部又は阿色又は薄黄色, ヘニノラスは単輪生状 (Fig M 10 B), 分生胞子の基質より直立, 又は時として気筒弁より直立, 120~430 μ × 28~39 μ 又は 41 μ , 分枝せず, 直立状又は小梗状粗面, 頂端膨大, 43~65 μ ; 梗は 5~12 カミ行又は微索状に群生, 87~106 μ 或は 143 μ × 25~33 μ , 分生胞子楕円, 卵形又は垂珠形, 29~37 μ × 23~31 μ , 人形状突起粗面, 又電子顕微鏡写真 (Fig E-10) にても同様粗面, 分生胞子連鎖行状又は幾分か円柱状, 長さ 30~80 μ .

スティーブ大気培養に於ける生落の発育は 25°C 5 日 11 28~30 mm, 10 日 11 70~74 mm, 20 日 11 82~85 mm, 30°C, 10 日 11 20~70 mm, 37°C, 発育不能, 生落表面白色はノアヘック大気培養よりも幾分か近い, 他の諸特性は同じ。

亜硝酸大気培養にては良好なる発育を小す 本菌株は各種土壌, 特に森林土壌より数多く分離さる。

10 *Penicillium trzebinskii* Zaleski.

Colonies on Czapek agar rather broadly spreading, attaining a diameter of 53 to 70 mm. in 10 to 12 days at 25°C (Fig C-10), 14 to 55 mm at 30°C; seldom growing at 37°C, (growing very well on NO_2 medium); velvety or velutinous (Fig 10A), smooth or radial furrowed, gray green or dark bluish green shades near Russian Green, with a white margin about 15 mm in wide; exudate lacking or limitedly, pale brown shades; odor lacking or indefinite, reverse quickly developing deep dull violet to dark fuscous shades, with surrounding agar similar or pale yellow shades, penicilli strictly monoverticillate (Fig M 10 B), conidiophores arising from substratum, sometimes from aerial mycelium, variable in length up to 120 to 430 μ by 28 to 39 or 41 μ , mostly unbranched, with walls punctate or small granular, with apices enlarged up to 43 to 65 μ in diameter; sterigmata in verticils of 5 to 12, about 87 to 106 or 143 μ by 25 to 33 μ , parallel or compact, acute type, conidia elliptical or ovate to subglobose, mostly 29 to 37 μ by 23 to 31 μ , with walls echinulate, and the echinulate or verruculose walls are shown by electron microscopy (Fig E-10), conidial chains parallel or loosely column up to 30 to 80 μ in length.

Colonies on steep agar growing broadly than Czapek, about 70 to 74 mm in 10 to 12 days at 25°C, 20 to 70 mm at 30°C, seldom growing at 37°C; reverse as on Czapek but developing dark shades less rapidly, the others characters as on Czapek.

Strains of this species occurs from soils and forest

*Zaleski K, Bul Acad Polonaise Sci Math, et Nat ser B, pp 501 502, Taf 59 1927

**Thom, C., The Penicillia, pp 273 294 1930

***Kaper K. B., Thom C. and Fennell D. J. A Manual of the Penicillia, pp 231 231 1919

****Kaper K. B. Can Acad Monographs no. 60 41 1922

11. *Penicillium trzebinskianum* Abe



Fig. M-11 A. *Penicillium trzebinskianum* Abe, FAT 1139, low power view of colony section showing velutinous character of texture

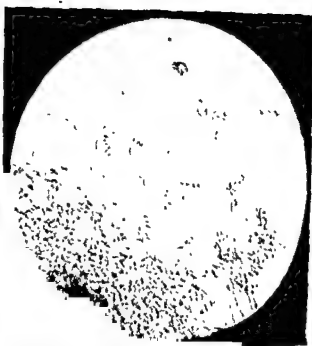


Fig. M-11 B. *Penicillium trzebinskianum* Abe, FAT 1139, detail of penicillus

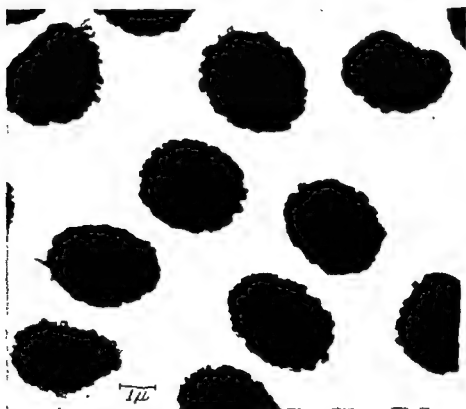


Fig. E-11 *Penicillium trzebinskianum* Abe, FAT 1139, conidia showing the echinulate or verruculose walls and the elliptical to ovate or subglobose form

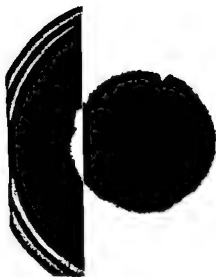


Fig. C-11. *Penicillium trzebinskianum* Abe, FAT 1138, on Czapek agar, 10 days

ソアヘック寒天培養に於ける生落の発育は 25°C にて 5 日目 17~20 mm; 10 日目 42~48 mm (Fig. C-11), 20 日目 60~70 mm; 30°C 10 日目, 46~55 mm, 37°C, 発育不能, 菌糸ヒョート状 (Fig. M-11A) 或は作か線毛状, 生落表面は平滑又は幾分か放射状の皺があり, 周辺部約 10~12 mm 巾, 白色, 分生胞子密生多く, 濃青緑色, 中心部暗黒緑色; 産出物欠; 臭, パンラ様; 生落裏面は黄緑或は桃褐色, 次第にオリープ灰色, 生落周辺部大, 黄色, 分生胞子柄一般に基質又は基菌糸より直立, 時として気菌糸から生ず, 60~280 μ \times 25~40 μ , 頂端膨大 37~69 又は 7.5 μ , 斑点状或は小顆粒状突起粗面, 時々隔壁あり; ヘニシラスは単輪生状 (Fig. M-11B), 梗長 5~12 カ顕著に群生, 8.7~12.5 μ \times 2.1~3.2 μ , 先端時に細い; 分生胞子楕円又は卵形或は時々近球形, 2.5~3.8 μ \times 2.3~3.1 μ , 大顆粒状突起粗面, 又電子顕微鏡写真 (Fig. E-11) にても同一様粗面, 分生胞子連鎖, 並行状又は幾分か円柱状, 長さ, 30~190 μ .

ステープ寒天培養に於ける生落の発育は 25°C にて 5 日目 18~23 mm, 10 日目 43~45 mm, 20 日目, 65~73 mm; 30°C 10 日目 46~47 mm; 37°C 発育不能, 著しい放射状皺があり, 生落裏面は褐色, 褐灰色, 他の諸特性は同上, 亜硝酸入培養にてはや良好なる発育を示す。

本菌株は 1 壇より分離さる。

11. *Penicillium trzebinskianum* Abe

Colonies on Czapek agar rather rapidly, attaining a diameter of 42 to 48 mm in 10 to 12 days at 25°C (Fig. C-11), 46 to 55 mm. at 30°C; seldom growing at 37°C; (growing and slightly sporulating on NO_2 -medium); appearing velutinous (Fig. M-11A) or subfloccose, consisting of some what compact basal felt, with a white margin 10 to 12 mm. wide, smooth or loosely radially furrowed, sporulating abundantly in darkish blue-green shades near Dusky Dull Green and in some, Dull Blackish Green in central areas; exudate lacking; odor definitely vanilla-like; reverse in yellowish green or vinaceous shades becoming olivaceous black, with surrounding agar in yellowish shades, conidiophores generally arising in a close stand directly from the substratum or basal felt, sometimes from aerial mycelium,

M-11B); sterigmata in verticils of 5 to 12, compact mostly 8.7 to 12.5 μ by 2.1 to 3.2 μ type, with conidium bearing tips sometimes narrowed; conidia elliptical to ovate or sometimes subglobose, mostly 2.5 to 3.8 μ by 2.3 to 3.1 μ with walls echinulate, and the echinulate or verruculose walls are shown by electron microscopy (Fig. E-11); chains of conidia in parallel or loose columns up to 30 to 190 μ in length

Colonies on steep agar spreading, up to 43 to 51 mm. in 10 to 12 days at 25°C, 46 to 47 mm at 30°C, seldom growing at 37°C; strongly radially furrowed, reverse near Umber shades becoming blackish brown, others characters as described above

Strains of this species occurs from soils



Fig. M-11 A. *Penicillium trzebinskianum* Abe, FAT 1139, low power view of colony section showing velutinous character of texture

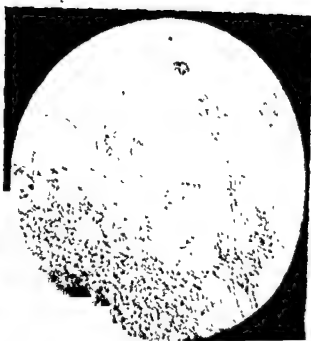


Fig. M-11 B. *Penicillium trzebinskianum* Abe, FAT 1139, detail of penicillus.

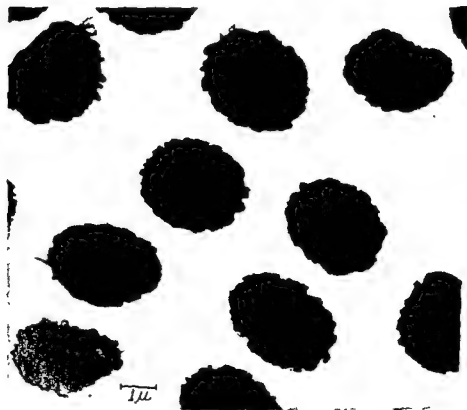


Fig. F-11. *Penicillium trzebinskianum* Abe, FAT 1139, conidia showing the echinulate or verruculose walls and the elliptical to ovate or subglobose form

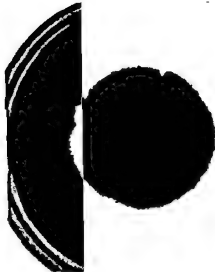


Fig. C-11. *Penicillium trzebinskianum* Abe, FAT 1138, on Czapek agar, 10 days

ノアヘック冬天培養に於ける生落の発育は 25°C にて 5 日 17~20 mm; 10 日 42~48 mm. (Fig. C-11), 20 日 60~70 mm; 30°C 10 日 46~55 mm; 37°C, 発育不能, 菌糸ビロード状 (Fig. M-11A) 或は僅かに綿毛状, 生落表面は平滑又は幾分か放射状の皺があり, 周辺部約 10~12 mm 巾, 白色, 分生胞子叢生多く, 濃青緑色, 中心部暗黒緑色; 渗出物欠; 臭, ハニラ様, 生落裏面は黄緑或は桃褐色, 次第にオリーブ色, 生落周辺大抵, 黄色; 分生胞子柄一般に基質又は基菌糸より直立, 時として気菌糸から生育, 60~280 μ \times 2.5~4.0 μ , 頂端膨大 3.7~6.9 又は 7.5 μ , 斑点状或は小顆粒状突起粗面, 時々隔壁あり; ヘニラスは単輪生状 (Fig. M-11B); 梗子 5~12 カ級密に群生, 8.7~12.5 μ \times 2.1~3.2 μ , 先端, 時に細い; 分生胞子柄四又は卵形或は時々近球形, 2.5~3.8 μ \times 2.3~3.1 μ , 人軒状突起粗面, 又電子顕微鏡写真 (Fig. E-11) にても同一様粗面; 分生胞子連鎖, 並行状又は幾分か円柱状, 長さ, 30~190 μ

スティープス冬天培養に於ける生落の発育は 25°C にて 5 日 18~23 mm; 10 日 43~45 mm, 20 日 65~73 mm, 30°C 10 日 46~47 mm, 37°C 発育不能, 著しい放射状皺があり, 生落表面は褐色, 褐色色, 他の諸特性は同上. 亜硝酸大培養にてはや良好なる発育を示す.

本菌株は 1 頃より分離さる.

11. *Penicillium trzebinskianum* Abe.

Colonies on Czapek agar rather rapidly, attaining a diameter of 42 to 48 mm in 10 to 12 days at 25°C (Fig C-11); 46 to 55 mm at 30°C, seldom growing at 37°C, (growing and slightly sporulating on NO_2 medium); appearing velutinous (Fig. M-11A) or subfloccose, consisting of some what compact basal felt, with a white margin 10 to 12 mm wide, smooth or loosely radially furrowed, sporulating abundantly in darkish blue-green shades near Dusky Dull Green and in some, Dull Blackish Green in central areas, exudate lacking; odor definitely vanilla-like, reverse in yellowish green or vinaceous shades becoming olivaceous black, with surrounding agar in yellowish shades, conidiophores generally arising in a close stand directly from the substratum or basal felt, sometimes from aerial mycelium, mostly 60 to 280 μ long by 2.5 to 4.0 μ in diameter, with apices, up to 3.7 to 6.9 or 7.5 μ in diameter, with walls punctate or small granular, sometimes septated, penicilli strictly monoverticillate (Fig. M-11B), sterigmata in verticils of 5 to 12, compact mostly 8.7 to 12.5 μ by 2.1 to 3.2 μ type, with conidium bearing tips sometimes narrowed, conidia elliptical to ovate or sometimes subglobose, mostly 2.5 to 3.8 μ by 2.3 to 3.1 μ with walls echinulate, and the echinulate or verruculose walls are shown by electron microscopy (Fig. E-11), chains of conidia in parallel or loose columns up to 30 to 190 μ in length.

Colonies on steep agar spreading, up to 43 to 54 mm in 10 to 12 days at 25°C, 46 to 47 mm at 30°C, seldom growing at 37°C, strongly radially furrowed, reverse near Umber shades becoming blackish brown, others characters as described above

Strains of this species occurs from soils

12. *Penicillium lividum* Westling.

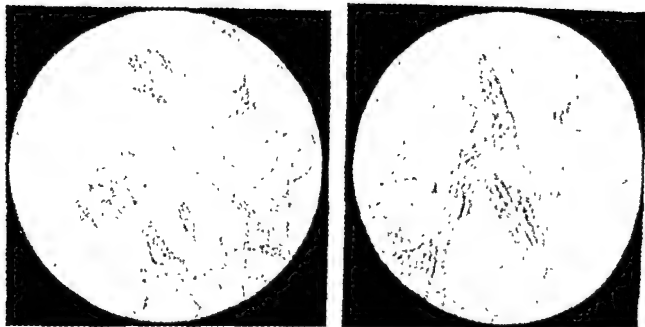


Fig. M-12 A. B. *Penicillium lividum* Westling, FAT 626, detail of penicilli



Fig. E-12. *Penicillium lividum* Westling, FAT 877, conidia showing the slightly rough walls and the definitely elliptical, ovate form



Fig. C-12. *Penicillium lividum* Westling, FAT 877, on Steep agar, 10 days

12. *Penicillium lividum* Westling

Colonies on Czapek agar growing rather rapidly or broadly, attaining a diameter of 51 to 70 mm in 10 to 12 days at 25°C, 40 to 45 mm at 30°C, seldom growing at 37°C; (growing very well on NO_3 -medium), loosely velutinous, about 1 mm. or 1.3 mm in central area deep, radial furrowed, with a white margin about 3 to 5 mm in wide, in blue-green or yellow green shades near Civette Green, American Green to Deep Olive to dark olive gray; exudate lacking; odor wanting or indefinite, reverse at first colorless becoming dull peach or flesh shades near Light Ochraceous Buff, with surrounding agar colorless, penicilli strictly monoverticillate (Fig M-12); conidiophores mostly single and arising from the substratum separately unbranched, long, up to 170 to 400 or 640 μ by 2.1 to 3.4 μ , sometimes septate, smooth or nearly so walled, with apices some what enlarged up to 3.1 to 5.0 μ in diameter, sterigmata mostly 5 to 10 in the vertical, parallel or loosely, 8.1 to 12.5 μ occasionally 15.0 μ by 2.1 to 3.0 μ ; conidia definitely elliptical or ovate, fusiform, mostly 3.1 to 4.4 μ by 2.3 to 3.1 μ , with walls smooth or nearly so, and the slightly rough (spines less than 0.1 μ) walls are shown by electron microscopy (Fig E-12); conidial chains tangled or loosely columns, up to 60 to 160 μ in length

Colonies on steep agar growing more rapidly, up to 72 to 76 mm in 10 to 12 days at 25 C (Fig C-12), 43 to 60 mm at 30 C, seldom growing at 37 C, the others characters as described above

Strains of this species occurs from soils

* Westling, R., Arkiv for Botanik II 58 131 137, 1911, Dale Ann Mycol 12 52 1914

** Thom, C. The Penicillia, pp 205 206 1930

*** Raper, K B. Thom, C. and Fennell, D I, A Manual of the Penicillia pp 190 192 1949

**** Abe, S., J Gen Appl Microbiology p 65 1956,

ノアヘック寒入培養に於ける集落の発育は 25°C にて 5 日 32~37 mm, 10 日 51~70 mm, 20 日 69~72 mm, 30°C, 10 日 40~45 mm, 37°C, 発育不能; 菌糸ビロード状様, 集落の厚さは中心部で 1~1.3 mm, 放射状の皺があり, 集落内周部は約 3~5 mm 巾の白色; 分生胞子着色部は青緑或は黄緑色, 順ふスリーブ色又は暗スリーブ灰色を呈す; 滲出物は久, 集落表面は灰色, 順ふ 薄又はくすんだ桃褐色を呈す, 集落周辺又は無色, ヘニシラスは車輪生状 (Fig M-12); 分生胞子柄は多くは単立で基質より直立し, 分枝せず, 170~400 又は 640 μ \times 2.1~3.4 μ , 時に隔壁を有し, 滑面, 頂端幾分か膨大, 3.1~5.0 μ , 梗は並行状又は類似状に 5~10 μ 群生, 8.1~12.5 μ 梗々 15.0 μ \times 2.1~3.5 μ , 分生胞子柄門又は卵形, 紡錘状, 3.1~4.4 μ \times 2.3~3.1 μ , 滑面, 又は電子顕微鏡写真 (Fig E-12) にては 2.0 μ 以下の横小粗面, 分生胞子座柄は柱状又は幾分か円柱状, 長さ 60~160 μ

スティープ大入培養にては 25 C にて 5 日 35~40 mm, 10 日 72~76 mm, (Fig C-12), 20 日 75~78 mm, 30 C 10 日 43~60 mm, 37 C 発育不能, 他の諸特性は同上,

亜硝酸大入培養にては良好なる発育を示す

本菌株は土壌より得らる。

14. *Penicillium implicatum* Biourge



Fig. M-14A. *Penicillium implicatum* Bourge. FAT 137, detail of single penicillus



Fig. M-14B. *Penicillium implicatum* Bourge. FAT 825, penicilli as developed at colony margin

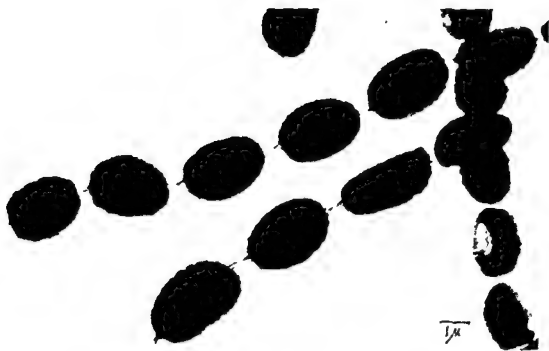


Fig. E-14. *Penicillium implicatum* Bourge. FAT 1215, conidia showing the slightly rough walls and the elliptical to ovate form

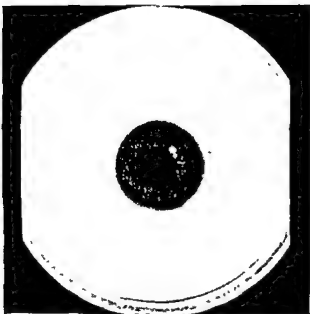


Fig. C-14. *Penicillium implicatum* Bourge, FAT 1299, on Czapek agar, 10 days

ノアヘック寒天培養に於ける集落の発育は 25°C にて 5 日 12~20 mm, 10 日 31~48 mm (Fig C-14) 20 日 52~72 mm; 30°C, 10 日 30~50 mm; 37°C, 発育不能, 菌糸はヒコト状或は類似状 集落円周部は約 10~20 mm. 中, 白色, 分生胞子の菌生多く, 幾分か壊れ易い傾向を有し, 中心部はもり上っている。分生胞子菌生部は濃い青緑或は黄緑色, 又は黄, 赤褐色; 集落裏面及び周辺部又は, 黄, 橙, 暗赤褐色, 赤色又は緑々紫又は灰色, ヘニラスは単輪生状 (Fig M 14A), 分生胞子柄短く, 根密に基質より直立又は時々短菌糸より生育, 多くは 30~120 μ 又は 190 μ × 18~28 μ 又は 35 μ , 滑面, 頂端は幾分か膨大, 35~68 μ 或は 94 μ , 袖は鋭形或は幾分か散開形に 6~12 又は 14 カ群生し, 93~119 μ 或は 162 μ × 20~30 μ 或は 37 μ , 分生胞子は楕円又は卵形, 地球形 23~32 μ × 18~25 μ 又は時々大型の 47 μ × 37 μ , 滑面, 又電子顕微鏡写真 (Fig E 14) にては 0.1 μ 以下の微小相曲, 分生胞子連鎖は円柱状或は行状又は類似形, 長さ 30~120 μ 或は 340 μ (Fig 14 B)。

ステイプルム寒天培養に於ける集落は 25°C にて 5 日 11 14~21 mm, 10 日 33~51 mm, 20 日 52~75 mm, 30°C, 10 日 30~50 mm, 37°C 発育不能, 他の諸特性は 11 L

※硝酸アムモニウム培養には発育不能

本菌株は 1 理, タバコ或は腐敗物等より数多く分離さる

14 *Penicillium implicatum* Bourge

Colonies on Czapek agar growing rather restrictedly, about 31 to 48 mm in 10 to 12 days at 25°C (Fig C-14); 30 to 50 mm at 30°C; seldom growing at 37°C; (growing little or not on NO_2 medium); velvety or velutinous, with growing white margin, narrow, about 10 to 20 mm in wide, very heavy sporing, umbonate, piled in center, showing some tendency to form crusts of conidia in age, bluish green or Yellow green, bluish gray green shades near Dark Russian Green, Dark American Green, Bluish Gray Green, to Dull Balckish Green or Andover Green, exudate lacking or limited, in small drops colorless, yellowish or in red brown shades; odor indistinct, weak or lacking, reverse and agar yellow to orange to deep red-brown or maroon or occasionally purplish or violet shades, penicilli usually monoverticillate (Fig M-14A), conidiophores short arising usually from the substratum in a dense stand or sometimes from trailing hyphae, mostly 30 to 120 or 190 μ by 18 to 28 or 35 μ , with walls smooth or nearly so, apices somewhat enlarged 35 to 68 or 94 μ in diameter; sterigmata compact or somewhat divergent, mostly 6 to 12 or 14 in the vertical, ranging from 93 to 119 or rarely 162 μ by 20 to 30 or 37 μ ; conidia elliptical or ovate, subglobose, 23 to 32 μ by 18 to 25 μ and sometimes larger 47 μ by 37 μ , with walls smooth or nearly so, and the slightly rough walls are shown by electron microscopy (Fig E 14), conidial chains column or parallel or loosely (Fig 14-B), up to 30 to 120 μ or 340 μ in length

Colonies on steep agar growing up to 33 to 51 mm in 10 to 12 days at 25°C, 30 to 50 mm at 30°C, seldom growing at 37°C, the others characters as on Czapek

Strain of this species occurs from soils and Tobacco and other deteriorating materials

*Bourge, Ph., Monograph La Cellule 33 fasc I., pp 278 280, col Pl IX and P I XIV, fig 82 1923

**Thom, C., The Penicillia, pp 210 211 1939

***Raper, K. B. Thom, C. and Fennell, D. I., A Manual of the Penicillia, pp 201-203 1949

****Abe, S., J. Gen. Appl. Microbiology p 67 1956

15. *Penicillium adametzioides* Abe

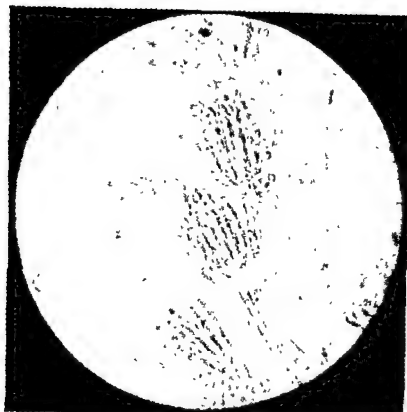


Fig. M-15. *Penicillium adametzoides* Abe, FAT 1302, detail of penicilli

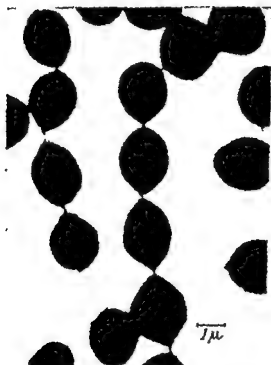


Fig. E-15 *Penicillium adametzoides* Abe, FAT 1302
conidia showing the smooth or nearly so walls
and the elliptical or subelliptical form.

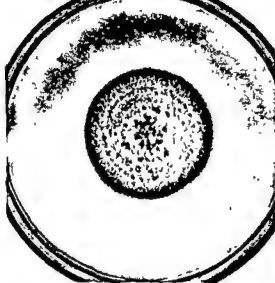


Fig C-15 *Penicillium adametvioides* Abe, FAT 1302, on Czapek agar, 10 days

15 *Penicillium adametvioides* Abe

ノアヘック水入培養に於ける生落の発育は 25°C に於て 5 日目 10~14 mm, 10 日目, 33~39 mm (Fig C-15) 20 日目, 58~60 mm, 30°C, 10 日目 33~39 mm; 37°C, 発育不能, 菌叢ビロート状, 或る菌株では縄状; 集落周囲部 10~15 mm 巾, 白色, 薄い, 或は幾分か縄状; 干潟又は時々放射状の皺を形成, 集落内は中心部 500~800 μ ; 分生胞子生産部は黄緑, 又はくすんだ黄緑色, 渗出物は微小或は豊富, 黄又は黄褐色, 生落表面は棕色或は橙褐色, 順次赤褐色, 桃紫, 桃色, 集落周辺水入は著しい呈色, 桃褐色, 黄赤褐色, 分生胞子柄は一般的に基質, 時として気菌糸より作り, 30~120 μ \times 18~31 μ , 頂端は膨大し, 31~62 μ , 滑面, ヘニラスは単輪生状 (Fig M-15), 梗子は横糸又は幾分か散開形に 6~10 μ 群生, 87~106 μ 或は 156 μ \times 18~25 μ , 滑面, 分生胞子柄又は坐球形, 23~33 μ \times 15~25 μ , 滑面, 電子顕微鏡写真 (Fig E-15) にても同一, 分生胞子産物は縄状, 長さ 30~90 μ

スティープズ水入培養に於ける生落の発育は 25°C に於て 5 日目 14~18 mm, 10 日目, 37~39 mm, 20 日目 64~68 mm, 30°C, 10 日目 38~39 mm, 37°C 発育不能, 分生胞子生産多く, 黄緑色, 生落表面黄褐色, 生落周辺水入赤褐色, 他の諸特性は同一。

本菌株は 1 皿より分離さる。

Colonies on Czapek agar are rather rapidly spreading, 33 to 39 mm in 10 to 12 days at 25°C (Fig C-15), 33 to 39 mm at 30°C; seldom growing at 37°C, (growing little or not on NO₂-medium); typically velvety, some strain funiculate, with a white margin 10 to 15 mm wide and thin or slightly funiculate, smooth or sulcate, sometimes radially furrowed, colony depth 500 to 800 μ in the central areas; sporulating throughout in pale yellow green near Greenish Glauous Blue in the marginal area and Pea Green in the central area, becoming Sage Green or Pea Green, exudate limited or abundant, Sulphur or Aniline Yellow, reverse in orange or orange cinnamon shades, becoming reddish brown, Pale Vinaceous or Light Vinaceous Lilac, with surrounding agar strongly pigmented in Vinaceous Tawny, becoming Xanthine Orange or Pale Green Yellow, conidiophores generally arising from the substratum, sometimes from hyphae, short, commonly 30 to 120 μ by 18 to 31 μ , with apices enlarged 31 to 62 μ in diameter, with smooth walls or nearly so, penicilli strictly monoverticillate (Fig M-15), comparatively short, sterigmata usually compact or some what divergent, crowded verticils, numbering about 6 to 10, mostly 87 to 106 μ or rarely 156 μ by 18 to 25 μ , acute type with smooth walls or nearly so, conidia elliptical to subglobose, 23 to 33 μ by 15 to 25 μ , smooth walled or nearly so in optical and electron microscopy (Fig E-15), and chains of conidia tangled, up to 30 to 90 μ in length

Colonies on steep agar rather rapidly spreading, 37 to 39 mm in 10 to 12 days at 25°C, 38 to 39 mm at 30°C, seldom growing at 37°C, heavily sporulating throughout in near Tea Green shades, reverse strongly brown-red shades, with surrounding agar in reddish brown shades, the other characters as on Czapek

Strains of this species isolated from soils

16. *Penicillium decumbens* Thom



Fig. M-16A. *Penicillium decumbens* Thom, FAT 1071, detail of penicilli.



Fig. M-16B. *Penicillium decumbens* Thom, FAT 1071, detail of penicilli as developed on aerial mycelium

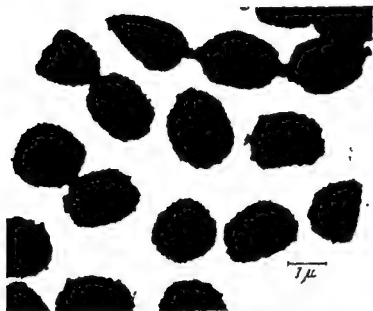


Fig. C-16 *Penicillium decumbens* Thom, FAT 601, conidia showing the slightly rough walls and the elliptical or ovate to fusiform form.

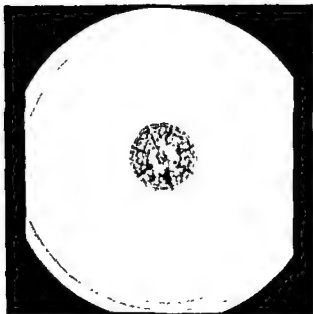


Fig C-16 *Penicillium decumbens* Thom, FAT 1071, on Czapek-agar, 10 days

ノアヘック水大培養に於ける集落の発育は 25°C に於て 5 日 9~16 mm, 10 日 18~25 mm (Fig. C-16), 20 日 20~61 mm, 30°C, 10 日 18~25 mm, 37°C 発育不能, 菌叢は, 或る菌株にはピロート状, 又菌株にて中心部に白色向糸の二次的発育を小す傾向あり, 又他菌株には小さな穂状或は籠状, 集落表面は平滑又は放射状の皺あり, 集落周囲部は 0.3~2.0 mm 巾, 白色, 分生胞子着生部は青緑色或は灰黄緑色, 順次同一色調又は灰オリーブ色を呈す, 渗出物は欠或は豊富, 無色; 集落裏面は無色或は一節分作かにオリーブ色又は緑色気味呈色, 集落周辺部は無色, ヘニラスは平輪生状 (Fig M 16) 時に分枝, 分生胞子柄, 短く, 30~45 μ 時に 120 μ \times 12~22 μ 又は 34 μ 頂端は幾分か膨入 25~40 μ (時々膨大 87 μ), 滑面, 穂状根生或は平行状に 6~14 方群生, 68~94 μ 或は 125 μ \times 16~32 μ , 分生胞子柄門, 卵形, 又は紡錘形, 21~30 μ 又は 33 μ \times 16~24 μ 滑面, 電子顕微鏡写真 (Fig E 16) には 0.1 μ 以下の小さな粗面, 分生胞子連鎖は幾分か円柱状或は籠状, 長さ 30~60 μ 又は 120 μ

マッーベ大培養の集落の発育は 25°C, 5 日 12~16 mm, 10 日 22~28 mm, 20 日 29~57 mm, 30°C, 10 日 15~27 mm, 37°C, 発育不能他の諸特性は同じ, 亜硝酸酸大培養にてはやや発育する

本菌株は諸種の土壌又は腐敗物より屢々分離さる

16. *Penicillium decumbens* Thom

Colonies on Czapek agar growing restrictedly, attaining a diameter of 18 to 25 mm in 10 to 12 days at 25°C (Fig C-16), 18 to 25 mm at 30°C, seldom growing at 37°C; (growing fairly well or very well on NO_2 medium), almost velvety in some strains, in others showing a tendency to develop white mycelial overgrowth in central areas, in others slightly floccose or funiculate appearance, smooth or radial furrowed, with a narrow white margin about 0.3 to 2.0 mm in wide, colored in bluish green or grayish yellow-green shades near Dark Bluish Glauous or Vetiver Green, Pois Green, becoming to Grayish Olive, Parrot Green, or similar shades, exudate lacking or abundantly, colorless; odor distinctive fragrant, suggesting soap perfumes, reverse colorless or slightly olive or greenish shades, with surrounding agar colorless, penicilli strictly monoverticillate (Fig M-16) and sometimes showing a branch, conidiophores mostly short, up to 30 to 45 μ or 120 μ by 12 to 22 μ or 34 μ , with apices somewhat enlarged up to 25 to 40 μ (sometimes larger 87 μ), smooth or nearly so walled, sterigmata mostly in compact or parallel clusters up to 6 to 14 in number, 68 to 94 μ or longer 125 μ by 16 to 22 or 32 μ , conidia elliptical or ovate, fusiform, 21 to 30 μ or 33 μ by 16 to 24 μ smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-16), conidia chains loosely column or tangled, up to 30 to 60 μ or 120 μ in length

Colonies on steep agar growing somewhat larger than on Czapek, growing about 22 to 28 mm in 10 to 12 days at 25°C, 15 to 27 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek

Strains of this species occurs from soils and deteriorating materials

*Thom, C. U S Dept Agr Bur Annu Ind, Bul 118 p 71, fig 28 1910, The Penicilla pp 197 193 1930

**Raper K. B. Thom, C. and Fennell, D. I. A Manual of the Penicilla pp 209 212 1919

***Abe, S J Gen Appl Microbiology pp 69 70 1956



17. *Penicillium capsulatum* Raper and Fennell.

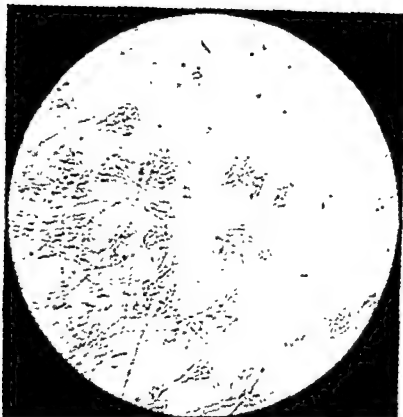


Fig. M-17. *Penicillium capsulatum* Raper and Fennell, FAT 564, detail of penicilli

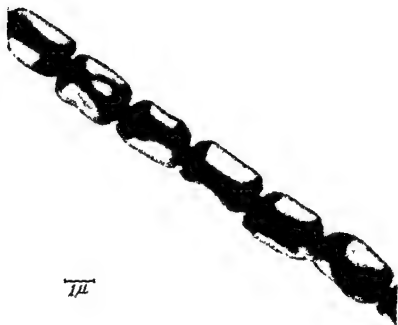


Fig. E-17. *Penicillium capsulatum* Raper and Fennell FAT 564, conidia showing the smooth or nearly so walls and the elliptical or capsule shape



Fig. C-17. *Penicillium capsulatum* Raper and Fennell, FAT 561, on czapek agar, 10 days

ノアヘック大培養に於ける集落の発育は 25°C にて 5 日 11.6~17 mm, 10 日 11.5~18 mm (Fig C-17) 20 日 11, 29~30 mm; 30°C, 10 日 11.12~18 mm, 37°C 発育不能; 菌糸ヒコート状或は厚かに絡み、集落表面平滑又は中心部幾分か隆起、集落周囲部 0.2~0.5 mm 巾、白色、分生胞子着生部は似黄緑色又は灰緑色、順次同一色調又は灰オリーブ色を呈す、分泌物は欠或は僅小、薄黄色; 集落裏面は黄又は黄色調、順次、赤色又は褐オリーブ色を呈す、集落周辺部は黄又は棕色; ヘニシラスは半輪生状、各種分岐状に示しているが、各々半輪生状特性を示す (Fig. M 17), 分生胞子柄は基質或は菌糸又は交錯網系より生ず、短く、30~60 μ \times 1.2~2.4 μ , 直端は膨大、31~50 μ 或は 56 μ , 滑面; 梗子線菌又は並行状に 5~10 カ群、7.5~9.4 μ 或は 12.5 μ \times 1.5~2.1 μ , 分生胞子は楕円、一般的に (Capsule tube) カプセル管形、26~32 μ \times 18~27 μ , 滑面、又定形顕微鏡下真 (Fig E 17) にても滑面; 分生胞子連鎖は幾分か棒状又は円柱状長さ 30~60 μ

スティーブス大培養に於ける集落の発育は 25°C に 5 日 11 約 9 mm, 10 日 11, 17~18 mm 20 日 11 約 32 mm; 30°C 10 日 11 17~18 mm, 37°C 発育不能、集落裏面赤色調; 他の諸特性は同上、

希釈酸バ人培養にてはや良好なる発育を示す、

本菌種は土壌又は腐敗物をより分離する、

17. *Penicillium capsulatum* Raper and Fennell

Colonies on Czapek agar growing restrictedly, attaining a diameter of 15 to 18 mm in 10 to 12 days at 25°C, (Fig C-17) 12 to 18 mm at 30°C, seldom growing at 37°C, (growing and slightly sporulating on NO₂-medium), velvety or slightly floccose, smooth or raised in central area, with growing white margin narrow, about 0.2 to 0.5 mm wide, in dull yellow green or gray green shades near Pistachio Green or Mytho Green, becoming similar or grayish olive; exudate lacking or limitedly, sulphur yellow, odor lacking or indefinite, reverse yellow or brownish shades, changing to red or brownish olive, with surrounding agar yellow or orange shades; penicilli monoverrucillate, borne on branches of varying length and occasionally more or less clustered but consistently retaining their individual character (Fig M-17), conidiophores ascending, arising primarily from the substratum or creeping, interlacing hyphae, from very short up to 30 to 60 μ by 1.2 to 2.4 μ , with apices larger up to 31 to 50 μ or 56 μ , smooth or nearly so walled, sterigmata compact or parallel in crowded cluster of 5 to 10, mostly 7.5 to 9.4 μ or 12.5 μ by 1.5 to 2.1 μ conidia elliptical, commonly capsule shaped, mostly 26 to 32 μ by 18 to 27 μ with walls smooth or nearly so, and the smooth or nearly so walls are shown by electron microscopy (Fig E 17), conidial chains loosely parallel or column, up to 30 to 60 μ in length

Colonies on steep agar growing similar on Czapek, about 17 to 18 mm in 10 to 12 days at 25°C, 17 to 18 mm at 30°C, seldom growing at 37°C, smooth or radial furrowed, reverse typically red shades, the other characters as on Czapek

Strains of this species occurs from soils and deteriorating materials

*Raper, A. B., and Fennell, D. I., Mycologia 40 528 530, fig 7 1948

**Raper, K. B., Thom, C. and Fennell, D. I., A Manual of the Penicillia pp 242 244 1949

***Abe, S., Gen J Appl Microbiology 72 1956

18. *Penicillium velutinum* van Beyma.

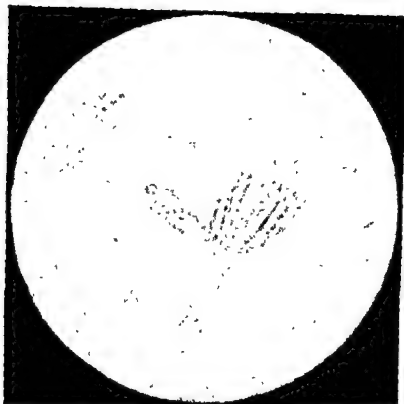


Fig. M-18. *Penicillium velutinum* van Beyma, FAT 1121, detail of penicilli



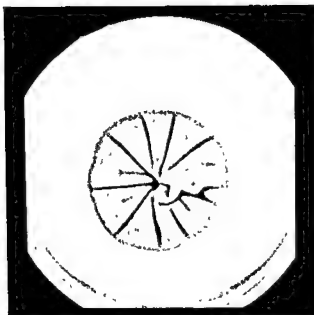


Fig. C-18 *Ruscelium velutinum* van Beyma, FAT 1121, on Czapek agar, 10 days

18 *Penicillium velutinum* van Beyma

Colonies on Czapek agar fairly rapidly growing, attaining a diameter of 39 to 50 mm in 10 to 12 days at 25°C (Fig. C-18), 43 to 48 mm at 30°C, seldom growing at 37°C, (growing very well on NO_3 -medium); typically or loosely radially furrowed, light to heavy sporing, almost velvety or velutinous, some strains subfloccose, in blue-green or dull olive green shades, becoming slate olive or grayish olive to deep slate olive shades, exudate lacking or limited, colorless; odor lacking or indefinite; reverse in dull yellow or vinaceous orange shades becoming grayish vinaceous or kaiser brown, with surrounding agar colorless, conidiophores commonly borne as branches from aerial hyphae, occasionally directly from the substratum, mostly 50 to 300 or 380 μ long by 2.1 to 2.7 or 3.4 μ , with apices somewhat enlarged up to 2.5 to 3.6 μ or 4.4 μ , with walls smooth or nearly so, penicilli sometimes strictly monoverticillate, usually ramigenous and irregularly branched (Fig. M-18), bearing conidial chains up to 60 to 120 μ in length, usually loosely tangled, sometimes loosely parallel, sterigmata usually in simple verticils numbering 3 to 7, mostly 6.2 to 8.0 or 9.4 μ by 1.5 to 2.4 or 3.1 μ , with tips somewhat pointed and usually loosely divergent, conidia globose or ovate to subglobose, about 2.1 to 3.1 or 3.4 μ , with walls echinulate or verruculose, and the echinulate or verruculose walls are shown by electron microscopy (Fig. E-18).

Colonies on steep agar spreading broadly, 42 to 51 mm in 10 to 12 days at 25°C, 45 to 50 mm at 30°C, seldom growing at 37°C, reverse darker shades than on Czapek, the other characters as on Czapek.

Strains of this species occurs from soils and deteriorating materials

*Van Beyma, F. H., Zentil F. Bakt etc., (II) 91, 352 353, fig. 6 1935

**Raper K. B. Thom, C. and Fennell, D. I., A Manual of the Penicillia, pp. 250 251, 1949

**Abe S. J. Gen. Appl. Microbiology 74 1569.

ソッヘックアズ培養に於ける集落の発育は 25°C に於て 5 日目 22~27 mm, 10 日目 39~50 mm, (Fig. C-18) 20 日目, 67~70 mm; 30°C, 10 日目, 43~48 mm; 37°C 発育不能, 集落表面は, 明確に又は幾分か放射状の皺があり, 分生胞子の着生は僅小或は豊富, 菌糸はロート状又は類似或は多少縮み状, 分生胞子着生部は青緑色或はくすんだオリーブ緑色, 順次黒オリーブ色又は灰オリーブ色を呈す, 分泌物は久又は僅小, 無色, 集落裏面はくすんだ黄或は桃褐色, 順次灰桃褐色又は赤褐色を呈す, 集落周辺部は無色, 分生胞子柄は草葉より直立又はは気管系より分岐着生, 50~300 μ 或は 380 $\mu \times 2.1 \sim 2.7$ 又は 3.4 μ , 頂端幾分か膨大, 2.5~4.4 μ , 滑面, ヘニラスは単純状で, (Fig. M-18) で, 多分岐状に着生, 又は不規則な分岐を示す, 分生胞子連鎖は幾分か螺旋状, 時に幾分か直行状, 長さ 60~120 μ , 梗は幾分か放射状に 3~7 カ群生, 6.2~8.0 又は 9.4 $\mu \times 1.5 \sim 2.4$ 又は 3.1 μ , 先端部幾分か細い, 分生胞子球形或は卵形又は亜球形, 2.1~3.1 又は 3.4 μ , 大斜状, 又は疣状粗面, 又は点状微隆々状 (Fig. E 18) にても同様粗面。

スティープス入培養の集落の発育は 25°C 5 日目 25~29 mm, 10 日目, 43~51 mm, 20 日目 73~77 mm, 30°C 10 日目 45~50 mm, 37°C, 発育不能, 集落裏面, ソッヘック入培養に於けるよりも暗紅色, 他の諸特性は同上。

亜硝酸入培養にては良好なる発育を示す

本菌株は土壌又は腐敗物より分離さる。

19. *Penicillium lilacinum* Thom.



Fig. M-19. *Penicillium lilacinum* Thom, FAT 1233, detail of penicilli



Fig. E-10. *Penicillium lilacinum* Thom, FAT 1233 conidia showing the smooth or nearly so walls and the elliptical or fusiform form



Fig. C-19. *Penicillium lilacinum* Thom, F&T 1233, on Czapek agar, 10 days

ノアヘックを人培養に於ける集落の発育は 25°C 5日 21~25 mm, 10日 41~55 mm (Fig C-19), 20日 62~75 mm; 30°C 10日 48~55 mm, 37°C 発育不能; 菌糸は綿毛状, 又は類似状, 或る菌株にては中心部が隆起, 或く、且放射状の皺を有し、最初は白色, 漸次分生胞子着生部は桃色, 桃紫色, 分生胞子着生度合は菌株にて異なる, 一般的に豊富, 集落門周囲は白色, 0.5~1.0 mm 巾, 発出物は欠又は僅小, 無色又は桃紫色, 集落表面は常に桃紫, 桃紫色, 漸次黒紫, 又は褐桃紫色, 分生胞子の柄は集落門周囲にては基質より直立, 又中心部にては気菌糸より生ず, 30~380 μ 又は以上 \times 18~30 μ 又は 40 μ , 頂端端幾分か膨大 23~40 μ , 滑面又は粗面, ヘニラスはサイズ及び形状は各種様々 (Fig M 19), 小整好状善しい散開状分生胞子連鎖は鏈状, 長さ 50~90 μ , 本種通例の分岐状ではない, 分枝は 6.2~25 $\mu \times$ 2.1~2.8 μ , 小型ヘニラスにては基質胞子の群生のみ, 基質胞子は 3~7 μ 幾分か横糸或は散開状に群生, 6.2~11.2 $\mu \times$ 2.0~2.8 μ , 梗の幾分か横糸に 6~8 μ 群生, 6.2~9.4 $\mu \times$ 1.5~2.5 μ , 比較的小く粗端細い, 分生胞子の柄又は特殊形, 2.5~3.5 $\mu \times$ 2.1~2.5 μ , 滑面, 又電子顕微鏡写真 (Fig E 19) にても滑面

ステーフル人培養に於ける集落の発育は 25°C にて 5日 22~33 mm, 10日 47~60 mm, 20日 68~80 mm, 30°C 10日 52~60 mm, 37°C 発育不能, 一般菌に分生胞子着生は豊富 好酸色調他の諸特性は同じ

常菌性人培養にては発育良好

本菌株は土壌及び他の自然物より分離する

19. *Penicillium lilacinum* Thom

Colonies on Czapek agar more or less rapidly spreading, attaining a diameter of 41 to 55 mm in 10 to 12 days at 25°C (Fig C-19); 48 to 55 mm at 30°C; seldom growing at 37°C, (growing very well on NO₂-medium), floccose loose texture, central colony areas raised in some strains, not in others, shallow, radial furrows, at first white, gradually developing lilac to vinaceous shades near Light Congo Pink or Pale Vinaceous Pink with the production and ripening conidia, sporulation varying in different strains, generally abundant with a white margin about 0.5 to 1.0 mm in wide; exudate lacking or limitedly, colorless to vinaceous, odor slight or lacking; reverse usually vinaceous or vinaceous purple shades, becoming blackish red purple or brownish vinaceous shades, with surrounding agar pale similar shades; conidiophores arising from the substratum at colony margin and from aerial hyphae in central colony areas, varying sizes, 30 to 380 μ or more by 1.8 to 3.0 μ or 4.0 μ , with apices somewhat enlarged up to 23 to 40 μ , with smooth or nearly so walled and the others finely roughened, penicilli asymmetric strongly divaricate, varying in size and complexity (Fig M-19), bearing tangled chains of conidia up to 50 to 90 μ in length, not branched in the usually manner for the genus, branches up to 6.2 to 25 μ by 2.1 to 2.8 μ , in smaller structures commonly consisting of a single verticil of metulae, metulae mostly 3 to 7 in verticil, mostly 6.2 to 11.2 μ by 2.0 to 2.8 μ , loosely compact or divergent, sterigmata mostly 6 to 8 in verticil, loosely compact, mostly 6.2 to 9.4 μ by 1.5 to 2.5 μ , abruptly tapering to a comparatively long, conidia elliptical or fusiform, 2.5 to 3.5 μ by 2.1 to 2.5 μ , smooth or nearly so walled, and the smooth or nearly so walls are shown by electron microscopy (Fig E-19)

Colonies on steep agar growing more rapidly, attaining a diameter of 47 to 60 mm in 10 to 12 days at 25°C, 52 to 60 mm at 30°C, seldom growing at 37°C, texture and general colony appearance as on Czapek generally heavier sporulating, hence in darker shades, the other characters as on Czapek. Strains of this species isolated from soils and other natural sources

*Thom, C. U. S. Dept. Agr., Bur. Anim. Ind. Bul. 118 72 75, fig. 30 1910

**Raper, J. B., Thom, C. and Fennell, D. I. A Manual of the Penicillia pp. 285-288 1949

***Abel, S. J. Can. Appl. Microbiology 7: 1974

20. *Penicillium janthinellum* Biourge



Fig. M-20. *Penicillium janthinellum*, FAT 1293, detail of penicilli.

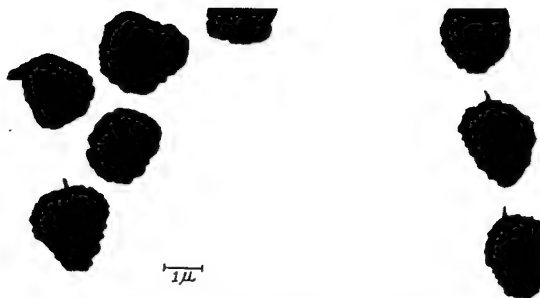
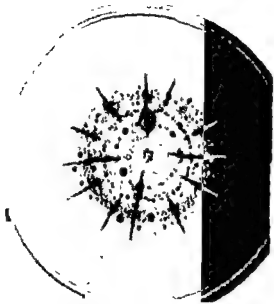


Fig. E-20 *Penicillium janthinellum* (Bourge, FAT 1293, conidia showing the slightly rough walls and the ovate to subglobose form with ends often spiculate



C-20. *Penicillium janthinellum*, FAT 1298, on Czapek agar, 10 days

ノヘック変大培養に於ける発生の発育は25°Cにて5日目18~42mm, 10日目38~74mm, 20日目55~76mm, 30°C10日目, 38~70mm; 37°C, 3~9mm, 菌糸は根状または放射状, 集落表面は根毛状様で発育, 平菌糸は不規則な又は放射状の線を有し, 菌絲にて黄赤, 赤, 桃, 桃紫色等に着色又は灰色, 分生胞子の発生は遅く又不規則に各種に着色, 黄緑又は青緑色調, 順次ナリフ, 又はオリーブ褐色を呈す; 分泌物は欠又は僅小, 屈々豊富, 灰色又は黄, 褐, 桃, 桃紫色; 集落表面は時に無色, 時に黄代の枯葉様の菌絲では無色, 新分離菌株では最初黄又は棕色, 速やかに橙赤, 赤, 赤紫, 又は赤褐色に部分的或は全面着色; 集落周辺寒天無色, 桃赤, 又は桃赤調; ヘニラスは不整浮状著しい散開状, 散離各サス変化に富む, 分生胞子連鎖群状或は幾分か散開状, 長さ30~160 μ ; 分生胞子柄各種変化に富み, 30~20 μ 又は時に500 μ ×12~28~38 μ , 頂端部幾分か膨大, 18~38 μ ×47 μ , 滑面又は顆粒状, 斑点状粗面, 分枝, 各種, 62~20 μ 又は31 μ ×13~38 μ ; 基部低部散開状に2~4カ群生, 52~21 μ ×12~27又は44 μ , 頂端部多少膨大; 梗子幾分か散開状或は斜生に3~8カ群生, 下部は広巾であるが頂端部小さく細い, 75~137 μ ×13~28 μ , 分生胞子, 卵形又は近球形, 端が鋭々尖る, 滑面, 21~37 μ ×18~31 μ , スズ子顕微鏡写真(Fig E-20)にても僅小な(0.1 μ 以下)粗面。

ステーパー変大培養に於ては25°Cにて5日目20~17mm, 10日目, 46~80mm, 20日目, 70~80mm; 30°C, 10日目, 45~74mm, 37°C, 3~30mm; 種々, ノヘック変大培養よりも一層濃紫色で, 又一層根毛状ヘニラスが少い, 他の諸特性は同上。

即断盤大培養には良好なる発育を示す。

本菌株は分布が広く, 各地の土壌又は各種好よりし

20. *Penicillium janthinellum* Bourge

Colonies on Czapek agar rapidly or broadly spreading, attaining a diameter of 39 to 74 mm in 10 to 12 days at 25°C (Fig C-20); 38 to 70 mm. at 30°C; 3 to 28 mm at 37°C, (growing very well on NO_3 medium), velutinous or subfloccose, with surface growth delicately floccose, smooth or irregularly wrinkled in central portions and radially furrowed, red, pink or vinaceous mycelium produced in some strains and lacking in others, at first white, but in most strains variously colored from the tardy and irregular development of conidial areas, mostly in yellow green or blue green shades near Bice Green, Russian Green or Nickel Green, French or Dark yellowish Green, becoming similar shades or grayish olive brown shades, exudate lacking or limited, occasionally abundantly produced, colorless to yellowish, brownish, pinkish or vinaceous, reverse of colonies sometimes colorless, especially in stock cultures after many transfers, but usually in new isolate commonly yellow to orange at first, quickly changing to orange-red, maroon or red-purple or red-brown shades localized or throughout, with surrounding agar colorless vinaceous or pinkish shades, penicilli typically asymmetric, strongly divaricate varying in size and complexity, (Fig M-20) with conidial chains tangled or loosely divergent, commonly up to 30 to 160 μ in length, conidiophores varying in complexity, to 30 to 120 μ or sometimes 500 μ in length by 12 to 28 μ or 38 μ in diameter, with apices somewhat enlarged up to 18 to 38 μ or 47 μ in diameter, with walls smooth or granular or punctate, branches variable, ranging from 52 to 20 μ or 31 μ by 13 to 38 μ , metulae divergent, 2 to 4 in verticil, ranging from 62 or 21 μ by 12 to 27 μ 44 μ , with apices more or less vesiculose, sterigmata loosely divergent or compact, 3 to 7 or 8 in verticil, enlarged at the base then tapering abruptly to fairly long conidium bearing tips, mostly 75 to 137 μ by 1.3 to 28 μ , conidia ovate to subglobose, with ends often apiculate and walls smooth or nearly so, commonly 21 to 37 μ by 1.8 to 3.1 μ , and the slightly rough walls are shown by electron microscopy (Fig E-20).

Colonies on steep agar growing somewhat more rapidly than on Czapek, 46 to 80 mm in 10 to 12 days at 25°C, 45 to 74 mm at 30°C, 3 to 30 mm at 37°C, often more intensely colored with the shades present on Czapek more accentuated, conidial structures less commonly monoverticil late than on Czapek but other wise conforming to the above description.

Strains of this species isolated from soils and samples of various places

*Bourge pil. Monograph La Cellule 33 fasc 1 pp 258 260 Col. Pl VII and Pl XII fig 70 1923

**Thom, C. The Penicillia pp 218 211 1930

***Raper, B. B., Thom, C. and Fennell, D. I. A Manual of the Penicillia pp 299 303 1949

****Abe, S. J. Gen Appl Microbiology 76 77 1956

21. *Penicillium echinulo-nalgiovense* Abe.



Fig. M-21 B. *Penicillium echinulo-nalgioense* Abe, FAT 907, enlarged view of penicilli on colony section



Fig. M-21 A. *Penicillium echinulo-nalgioense* Abe, FAT 907, low power view of colony section showing typically velvety character of texture

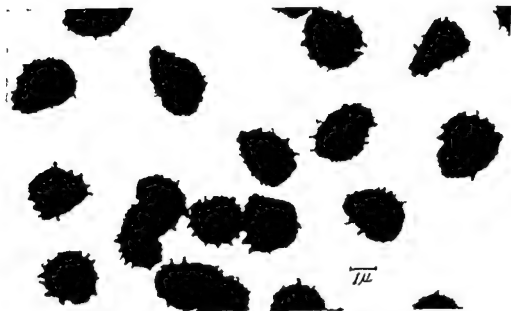


Fig. L-21. *Penicillium echinulo-nalgioense* Abe, FAT 884, conidia showing the echinulate or verruculose walls and the ovate near straw berry form or subglobose form

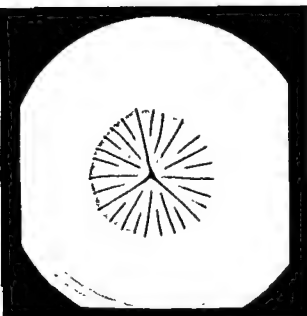


Fig. C-21. *Penicillium echinulo-nalgiovense* Abe, FAT 907, on Czapek agar, 10 days.

ノアヘック大入培養に於ける集落の発育は 25°C にて 5 日 11 15~19 mm, 10 日 11 36~37 mm (Fig. C-21); 20 日 11 56~58 mm; 30°C, 10 日 11 35~45 mm; 37°C, 発育不能; 菌叢ピロウ状又は僅かに綿毛状, 放射状の叢があり, 集落円周は白色, 又は薄黄色, 10~20 mm 巾; 分生胞子着生部はオリーブ或は黄緑色, 順次灰黄緑色に変色, 滲出物は欠又は微小, 無色; 集落表面は赤色又は赤紫色, 集落円周部又は薄黄或は薄赤色, 分生胞子柄は基質又は基質菌糸より直立又は時々気菌糸より生ず, 長短あり, 60~190 μ 又は 380 $\mu \times 25 \sim 33 \mu$, 頂端部 30~44 μ , 粗面, ヘニラス小管環生状で著しい散開型, 時々分枝を有し基底梗了, 梗了を有し, 分枝し及び基底梗了は各種着生状を示し各サイズも変化に富み (Fig M21) 分枝は 10~20 μ 又は 25 $\mu \times 20 \sim 32 \mu$, 基底梗了は散開型, 93~156 μ 又は 20 $\mu \times 21 \sim 32 \mu$, 梗了は短直又は幾分か斜着て 3~7 カ群生 85~104 μ 又は 125 $\mu \times 21 \sim 34 \mu$ 分生胞子卵形 (いちご形) 又は亜球形, 25~38 μ , 大柄又は粒状粗面, 分生胞子連鎖は円柱状又は幾分か粒状 長さ 30~70 μ 又は 130 μ , 分生胞子は電子顕微鏡より (Fig E-21) にても同様大柄 粒状粗面

スティーフル大入培養に於ける集落の発育は 25°C にて 5 日 11 21~23 mm, 10 日 11 47~48 mm, 20 日 11 70~75 mm, 30°C, 10 日 11 46~48 mm, 37°C 発育不能, 他の諸特性は同し

亜硝酸大入培養にても良好なる発育を小す

本菌株は土壌より分離せる

21. *Penicillium echinulo-nalgiovense* Abe

Colonies on Czapek agar grow rather restrictively, attaining a diameter of 36 to 37 mm in 10 to 12 days at 25°C (Fig C-21), 35 to 45 mm at 30°C; seldom growing at 37°C; (growing very well on No.2 medium), velutinous or subfloccose, consisting of a fairly close network of vegetative mycelia bearing crowded conidial structures; radially furrowed, with a white or pale yellow margin 10 to 20 mm wide, conidial areas in olive or yellow green shades near Oliv Green or Lincoln Green, becoming Citrine Drab with age; exudate lacking or limited colorless, odor limited moldy; reverse in typical reddish shades near Maroon, Victoria Lake or Hay's Maroon, with surrounding agar in pale yellow or light reddish shades; conidiophores arising primarily from the substratum or from basal felt, and sometimes from aerial hyphae, variable in length, commonly up to 60 to 190 μ or 380 μ long by 25 to 33 μ in diameter, typically rough-walled, and with apices 30 to 44 μ in diameter; penicilli biverticillate, asymmetrical and strongly divaricate (Fig M21), consisting variously of occasional branches metulae and sterigmata, with branches and metulae varying markedly in arrangement and in size, branches variable, commonly 10 to 20 μ or 25 μ in length by 20 to 32 μ in diameter, metulae typically divergent, 93 to 156 μ or 20 μ by 21 to 32 μ , sterigmata in compact or loosely compact verticals of 3 to 6 or 7, mostly 85 to 104 μ or 125 μ by 21 to 34 μ acute type, conidia ovate (near strawberry form) or subglobose, mostly 25 to 38 μ typically echinulate or verruculose walled, conidial chains usually columnar or loosely tangled up to 30 to 70 or 130 μ in length, and conidia with echinulate or verruculose walls as seen in electron microscopy (Fig E-21)

Colonies on steep agar rather more rapidly than on Czapek, 47 to 48 mm in 10 to 12 days at 25°C, 46 to 48 mm at 30°C, seldom growing at 37°C, the other characters are as described above

Strains of this species occurs from soils

*Abe & J Gen Appl Microbiology, pp 80 81 1956

22. *Penicillium canescens* Sopp

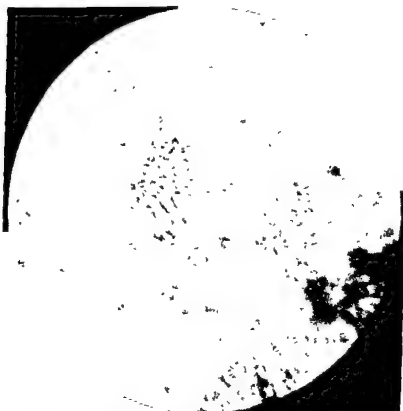


Fig. M-22. *Penicillium canescens* Sopp. IAT 832, detail of single penicillus

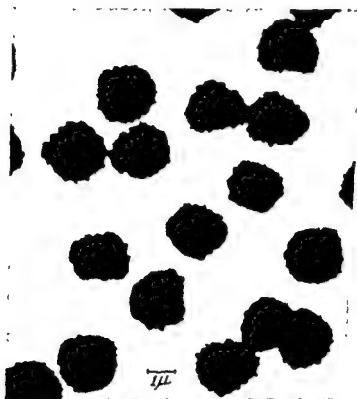


Fig. E-22. *Penicillium canescens* Sopp. IAT 832, conidia showing the delicately rough walls and the girdle or subgirdle lines



Fig. C-22. *Penicillium canescens* Sopp, FAT 832, on Czapek agar, 10 days.

ノアヘック冬人培養に於ける生菌の発育は 25°C にて 5 日 11 20~24 mm, 10 日 11 35~75 mm (Fig C-22) 20 日 11, 60~78 mm; 30°C 10 日 11 32~70 mm, 37°C 発育不能, 菌糸は多少綿毛状, 放射状の皺があり, 生菌の周囲は白色, 2~4 mm. 巾, 分生胞子着生部は青灰緑色, 順次灰オリーブ色を呈す, 分泌物は僅少, 無色又は薄褐色, 生菌表面は 5~6 日目薄紫, 又は薄紫色, 順次黄又は濃黄褐色; 或は赤褐色, 生菌の辺界又は薄紫, 又又は黄色調, ヘニラスは不整絨毛状, 散開型で各種形状, サイズ, 着生状況多し, (Fig M-22), 分生胞子柄は基質又は気菌糸より短く分枝, 60~300 μ 又は以上 \times 25 μ ~35 μ , 先端は幾分か膨大 31~41 μ , 顆粒状粗面, 分枝 75~20 μ \times 25~34 μ , 先端は 2~4 カ散開状に着生, 93~156 μ \times 25~34 μ , 枝は 3~6 カ群生, 75~10 μ \times 17~25 μ , 比較的小く先端は細い, 分生胞子連鎖は短所, 又は幾分か球状, 長さ 30~100 μ , 分生胞子の球形又は亜球形, 21~30 μ , 時に人きく, 人かな粗面, 電子顕微鏡写真 (Fig E-22) にて明らかな (0.1 μ 前後) の粗面

ステープル人培養に於ける生菌の発育は 25°C にて 5 日 11 23~34 mm, 10 日 11, 45~80 mm, 20 日 11 70~85 mm, 30°C, 40~73 mm; 37°C 発育不能, 他の諸特性は同し

亜硫酸人培養にては良好な発育を小す
木屑等は土壌より分離さる。

22. *Penicillium canescens* Sopp

Colonies on Czapek agar attaining a diameter of 35 to 75 mm in 10 to 12 days at 25°C (Fig C-22); 32 to 70 mm. at 30°C; seldom growing at 37°C, (growing very well on NO_2 medium), with surface more or less floccose, radiately furrowed, with a white margin 2 to 4 mm wide, bluish gray green shades, becoming grayish olive, exudate limited colorless or pale amber, odor lacking or indefinite; reverse Pale Violet or Pale Hortense Violet in 5 to 6 days, becoming yellow, deep orange-brown or red brown shades, with surrounding agar pale lilac or dull yellow shades, penicilli abundantly produced, variable in size and complexity, strongly divaricate (Fig M-22), conidiophores arising from the substratum or short branches from aerial hyphae, up to 60 to 300 μ or more by 25 to 35 μ , with apices somewhat enlarged 31 to 41 μ with walls granular, branches usually about 75 to 20 μ by 25 to 34 μ ; metulae divergent, 2 to 4 verticils, 93 to 156 μ by 25 to 34 μ ; sterigmata in clusters of 3 to 6 or 10, mostly 7.5 to 10 μ by 17 to 25 μ , with definite conidium-bearing tips narrow but comparatively short, conidial chains column or loosely tangled, up to 30 to 100 μ , conidia globose or subglobose, mostly 21 to 30 μ , occasionally larger, with slightly roughened walled, and the delicately rough walls are shown by electron microscopy (Fig. E-22)

Colonies on steep agar growing more rapidly than on Czapek, about 45 to 80 mm in 10 to 12 days at 25°C, 40 to 73 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek

Strains of this species occurs from soils

*Sopp, O. Monogr pp 181 182, Taf. XIV, fig 136, Taf. XXIII fig 29 1912

**Thom, C. The Penicillia pp 347 348 1930

***Raper K. B., Thom, C. and Fennell D. I., A Manual of the Penicillia, pp 316 319 1946

****Abe, S. J. Gen Appl Microbiol, 81-82 1976



Fig. M-22. *Penicillium canescens* Sopp. FAT 832, detail of single penicillus

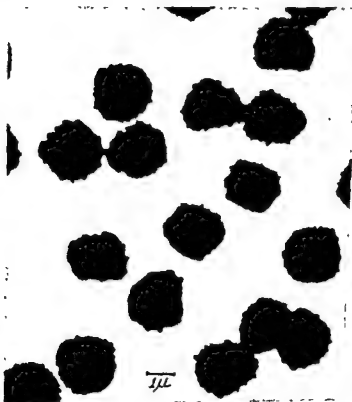


Fig. E-22. *Penicillium ignea* Sopp. FAT 832, conidia showing the delicately rough walls and the globose or subglobose form



Fig. C-22. *Penicillium canescens* Sopp, FAT 832, on Czapek agar, 10 days.

ノアヘック大入培養に於ける集落の発育は 25°C にて 5 日 11 20~24 mm, 10 日 11 35~75 mm (Fig C-22) 20 日 11, 60~78 mm; 30°C 10 日 11 32~70 mm, 37°C 発育不能。菌糸は多少綿毛状、放射状の叢があり、集落の周縁は白色、2~4 mm 中、分生胞子系生部は青灰緑色、順次灰ナリーブ色を呈す、渗出物は甚少、無色又は薄褐色、生落裏面は 5~6 日 11 薄赤、又は薄紫色、順次黄又は濃粉初色; 又は赤褐色、生落周辺部又は薄紫、赤又は黄色調; ヘニラスは小整齊輪状、散開型で各種形状、サイズ、菌生状況変多し、(Fig M-22)、分生胞子柄は草質又は気管系より短く分枝、60~300 μ 又は以上 \times 2.5 μ ~3.5 μ 、頂端部幾分か膨大 3.1~4.1 μ 、顆粒状粗面、分枝 7.5~20 μ \times 2.5~3.4 μ 、果梗は 2~4 カ散開状に着生、9.3~15.6 μ \times 2.5~3.4 μ ; 梗は 3~6 カ群生 7.5~10 μ \times 1.7~2.5 μ 、比較的短く先端細い、分生胞子連鎖は緩密、又は幾分か粒状、長さ 30~100 μ 、分生胞子球形又は亜球形、2.1~3.0 μ 、時に大きく、粗かな粗面、毛茸顕微鏡的 (Fig E-22) にても僅かな (0.1 μ 前後) の粗面

ステーパー大入培養に於ける集落の発育は 25°C にて 5 日 11 23~34 mm, 10 日 11, 45~80 mm, 20 日 11 70~85 mm, 30°C, 40~73 mm; 37°C 発育不能; 菌の諸特性は同 1

亜顕微鏡大入培養には良好な発育を小す、

本菌株は土壌より分離さる。

22 *Penicillium canescens* Sopp

Colonies on Czapek agar attaining a diameter of 35 to 75 mm in 10 to 12 days at 25°C (Fig C-22), 32 to 70 mm at 30°C; seldom growing at 37°C; (growing very well on NO_2 -medium), with surface more or less floccose, radiately furrowed, with a white margin 2 to 4 mm wide, bluish gray green shades, becoming grayish olive, exudate limited colorless or pale amber, odor lacking or indefinite; reverse Pale Violet or Pale Hortense Violet in 5 to 6 days, becoming yellow, deep orange-brown or red brown shades; with surrounding agar pale lilac or dull yellow shades; penicilli abundantly produced, variable in size and complexity, strongly divaricate (Fig M 22), conidiophores arising from the substratum or short branches from aerial hyphae, up to 60 to 300 μ or more by 2.5 to 3.5 μ , with apices somewhat enlarged 3.1 to 4.1 μ with walls granular; branches usually about 7.5 to 20 μ by 2.5 to 3.4 μ , metulae divergent, 2 to 4 verticils, 9.3 to 15.6 μ by 2.5 to 3.4 μ ; sterigmata in clusters of 3 to 6 or 10, mostly 7.5 to 10 μ by 1.7 to 2.5 μ , with definite conidium bearing tips narrow but comparatively short, conidial chains column or loosely tangled, up to 30 to 100 μ , conidia globose or subglobose, mostly 2.1 to 3.0 μ , occasionally larger, with slightly roughened walled, and the delicately rough walls are shown by electron microscopy (Fig E-22)

Colonies on steep agar growing more rapidly than on Czapek, about 45 to 80 mm in 10 to 12 days at 25°C, 40 to 73 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek

Strains of this species occurs from soils.

*Sopp, O. Monogr pp 181 192 Taf, XIV, fig 136, Taf XXIII fig 28 1912

**Thom, C. The Penicillia pp 317 318 1930

***Raper, A. B. Thom C and Fennell D I A Manual of the Penicillia, pp 316 319 1946

****Abe, S J Gen Appl Microbiology 81 82 1956.



23. *Penicillium jensenii* Zaleski



Fig. M-23. *Penicillium jeikei* Zaleski, FAT 770, detail of penicilli



Fig. E-23. *Penicillium jeikei* Zaleski FAT 770 conidia showing the delicately echinulate or verruculose walls and the globose to subglobose form

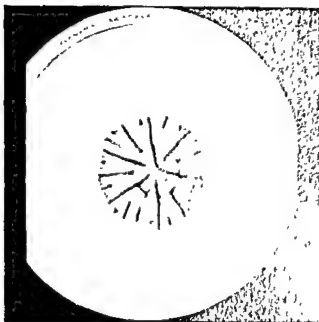


Fig. E-23. *Penicillium jeikei* Zaleski, FAT 771 on Czapek agar, 10 days

ファック寒天培養に於ける集落の発育は 25°C にて 5 日目、約 18 mm, 10 日目 25~38 mm, 20 日目、約 52 mm, 30°C, 10 日目、約 42 mm; 37°C 発育不能; 集落中心部は隆起又は凹み、放射状の皺があり、菌叢は幾分か輪毛状又は羊毛状、集落円周部は白色、1~2 mm 巾、分生胞子着生部は暗黄緑又は暗青緑; 産出物は欠; 集落裏面は無色又は鈍、黄色、集落周辺部は鈍色、ヘニラスは苦しい散開型、屢々多分枝性、大型ヘニラスにては 2~3 コ又は以上の基感梗子を有し、小型では一般的に欠; 分生胞子柄は変化に富み、100~380 μ 又は以上 \times 20~28 μ , 頂端部は幾分か膨大 25~35 μ , 滑面; 分枝は 75~20 $\mu \times$ 20~28 μ ; 基感梗子は 80~112 $\mu \times$ 20~28 μ , 2~4 カ群生、梗子は幾分か枯密に 5~7 カ群生、75~96 $\mu \times$ 18~24 μ , 分生胞子連鎖は幾分か円柱状、長さ 30~90 μ , 分生胞子は球形又は亜球形、20~27 μ , 僅かな粗面、又電子顕微鏡写真 (Fig E-23) にても (Y かな粗面 (0.1 μ 前後)。

スティープ寒天培養に於ける集落の発育は 25°C にて 5 日目約 20 mm, 10 日目、約 38 mm; 20 日目、約 52 mm, 30°C, 約 45 mm, 37°C には発育不能; 他の諸特性は同上。

砂質栽培地上の発育は良好。

本菌株は土壌より分離さる。

23 *Penicillium jeikei* Zaleski

Colonies on Czapek agar attaining a diameter of about 38 mm. in 10 to 12 days at 25°C (Fig. E-23); seldom growing at 30°C; NO₂ medium, radial surface raised or depressed, subglobose, white margin 1 to 2 mm wide; Sage Green or Pea Green at 25°C; Green with the ripening of conidia; produced, odor lacking or indefinite, uncolor to dull peach or yellow shades, with surrounding agar colorless, penicilli conspicuously divaricate, often appearing ramigenous, in larger structures usually consisting of a fairly definite terminal cluster of 2, 3, or more metulae, in smaller structures commonly not so arranged; conidiophores variable, up to 100 to 380 μ or more by 20 to 28 μ , with apices somewhat enlarged up to 25 to 35 μ , with walls smooth or nearly so, branches commonly variable, 75 to 20 μ by 20 to 28 μ , metulae variable, commonly 80 to 112 μ by 20 to 28 μ , 2 to 4 in verticil; sterigmata usually in clusters of 5 to 7, loosely compact, 75 to 96 μ by 18 to 24 μ ; conidial chains loosely columnar, up to 30 to 90 μ in length, conidia globose to subglobose, 20 to 27 μ , with walls delicately roughened, and the delicately echinulate or verruculose walls are shown by electron microscopy (Fig E-23)

Colonies on steep agar attaining a diameter of about, 38 mm. in 10 to 12 days at 25°C; about 45 mm at 30°C; seldom growing at 37°C; the other characters as on Czapek.

Strains of this species occurs from soils

• Zaleski, K., Bul Acad Polonaise Sci Math et Nat Ser B, pp 494-495, Taf 57 1927.

• Thom, C., The Penicillia, pp 346-347, 1930

• Raper, K B., Thom, C and Fennell, D I, A Manual of the Penicillia, pp 322-323 1949

• Abbe, S. I. Gen. Appl. Microbiology p 82 1956

24. *Penicillium nigricans* (Bainier) Thom



Fig. M-24. *Penicillium nigricans* (Bainier-Thom, FAT 949, detail of penicilli)

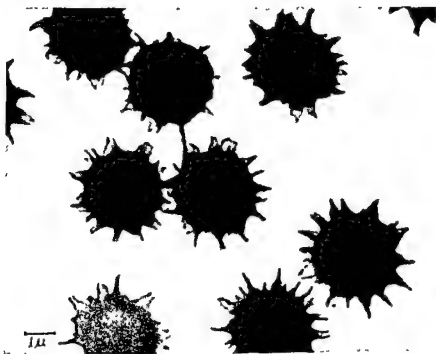


Fig. L-24. *Penicillium nigricans* (Bainier-Thom, FAT 949) conidia showing the aculeate walls and the glabrous or subglabrous form.

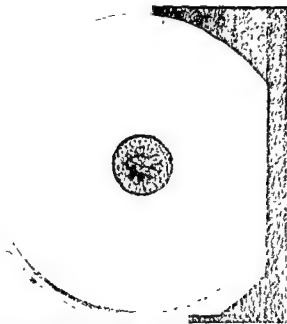


Fig. C-24. *Penicillium nigricans* (Bainier) Thom, FAT 412, on Czapek agar 10 days

24. *Penicillium nigricans* (Bainier) Thor

ツァペク寒天培養に於ける集落の発育は 25°C にて 5 日目約 12 mm, 10 日目 22~30 mm (Fig. C-24); 20 日目約 40 mm; 30°C, 10 日目約 14 mm; 37°C 発育不能; 菌叢ピロート状或は近似的, 平面的に或は放射状を有し, 集落円周部は白色, 約 0.5 mm 巾; 分生胞子着生部は灰, 黒灰, オリーブ灰, 又は暗灰オリーブ色, 順次同一色調又はオリーブ黒色を呈す; 集落裏面は紅, 暗赤, 赤褐色, 順次赤色調, 集落周辺部は黄橙, 赤橙色; 滲出物は豊富無色或は僅かに黄色調, ヘニノラスは不整斉輪生状, 著しい散開型 (Fig. M-24), 分生胞子柄長さ変化に富み, 厚々短く, 90~250 μ × 25~42 μ , 頂端部幾分か膨大し, 40~50 μ , 滑面; 分枝は変化に富み, 18~31 μ × 28~34 μ , 頂端部 43~56 μ , 基底梗子は著しい散開型, 62~125 μ × 20~32 μ , 一般的に膨大型に着生し, 各々各輪状類似の緻密な梗子を有す; 梗子は通常多少散開状に 5~10 カ群生し, 62~75 μ × 23~30 μ ; 分生胞子は 23~31 μ 或は 35 μ , 球形又は亜球形, 長大刺状粗面, 又電子顕微鏡写真にても (Fig. E-24), 0.3 μ 以上の長大刺状粗面, 分生胞子連鎖は屈々並行状, 通常, 散開状又は鏈状, 長さ 50~80 μ .

スティーブ寒天培養にての集落の発育は 25°C にて 5 日目約 14 mm, 10 日目約 26 mm, 20 日目約 47 mm; 30°C 10 日目約 19 mm; 37°C 発育不能, 他の諸特性は同上。

華爾散寒天培養にては発育不能。

本菌株は上壤より得られる。

Colonies on Czapek agar grow up rather erectly, 22 to 30 mm in 10 to 12 days at 25°C (Fig. C-24); about 14 mm at 30°C, seldom growing at 37°C, (growing little or not on N₂-medium), velvety or nearly so, plane of surface growing with a white margin about 0.5 mm wide, and areas in various shades of gray, streaky, dark olive gray, and Dark Grayish Olive, becoming Mouse Gray or Olivaceous Black, running to deep orange to deep ferruginous or red brown, becoming reddish shades, with surrounding agar yellow orange to reddish orange shades, odor strongly, suggesting certain species of Actinomyces, exudate abundantly, colorless or slightly yellowish; penicilli asymmetric conspicuously divaricate (Fig. M-24), conidiophores variable in length, often very short, 90 to 250 μ by 25 to 42 μ , with apices somewhat enlarged up to 40 to 50 μ , with walls smooth or nearly so; branches variable, 18 to 31 μ by 28 to 34 μ , with apices 43 to 56 μ in diameter, metulae strongly divergent, variable, about 62 to 125 μ by 20 to 32 μ , with each typically supporting a compact verticil of sterigmata simulating commonly inflated a monovericillate head, sterigmata usually borne in clusters of 5 to 10, more or less divergent, about 62 to 75 μ by 23 to 30 μ , conidia 23 to 31 or 35 μ in diameter, globose or subglobose, with walls aculeate and the aculeate walls are shown by electron microscopy (Fig. E-24), conidial chains occasionally parallel but usually divergent or tangled, 50 to 80 μ in length.

Colonies on steep agar grown up about 26 mm in 10 to 12 days at 25°C, about 19 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek

Strains of this species occurs from soils

*Thom, C., *The Penicillia*, pp. 351-353, 1930

**Raper, K. B. Thom, C. and Fennell, D. I., *A Manual of the Penicillia*, pp. 325-329, 1949

***Abe, S. *J. Gen. Appl. Microbiology* pp. 82-83, 1956

25. *Penicillium melinii* Thom

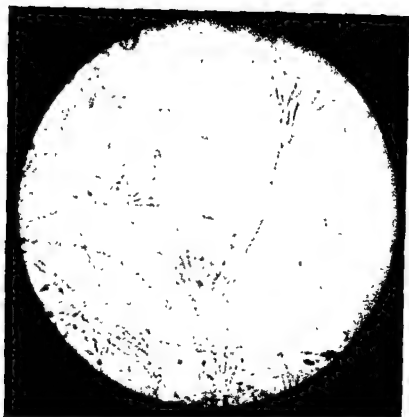


Fig. M-25. *Penicillium melinii* Thom, FAT 581, detail of penicilli.

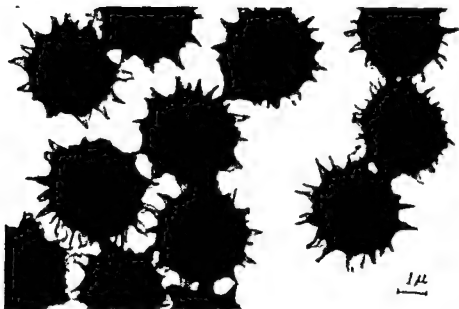


Fig. F-25. *Penicillium melinii* Thom, FAT 581, conidia showing the aculeate walls and the glabrous form.

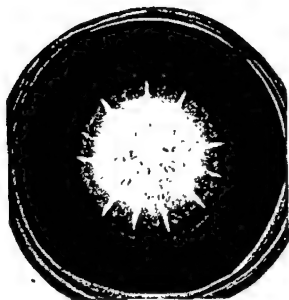


Fig. C-25. *Penicillium melinii* Thom, FAT 581, on Czapek agar, 10 days

ソッヘックを入培養に於ける生落の発育は 25°C にて 5 日目 24~30 mm, 10 日目約 51~52 mm; 20 日目 55~67 mm; 30°C 10 日目 45~50 mm, 37°C 発育不能; 菌叢はピロート状、緻密な菌叢で、多くの菌株にては豊富なペニシラスを有する硬い基礎文錯菌糸帯を有す、著しい放射状の皺を有し、又中心部が隆起す; 生落周囲部は白色、15~20 mm 中、分生胞子着生部は黄緑又はクサンド緑色、順次灰緑、灰暗オリーブ色を呈す、滲出物は欠或は豊富、橙黄色、又は暗褐色調; 生落裏面は黄、橙黄、暗褐、又は紫褐色調; 生落周辺侵入は同一様色調呈色、ヘニシラスは変化に富み、不整斉輪状、著しい散開型、種々厚輪状を呈すが、併し散開状の不均一な分枝、基礎梗子の群生を有す、分生胞子柄は各様の長さで、30~150 μ 又は 120 μ × 19~31 μ 又は 36 μ 頂端部は幾分か膨大し、31~44 μ 、横壁は顆粒状又は瘤状粗面、分枝は 10~30 μ × 19~36 μ 、基礎梗子は著しい散開状に 2~4 カ節、89~156 μ 又は、20 μ × 18~25 μ 又は 34 μ 、顆粒状、又は直点状粗面、梗子は粉索又は幾分か散開状に 5~10 カ節生し、62~81 μ × 15 μ ~25 μ 、中心は中しく、頂端部は急に細い、分生胞子連鎖は不規則な鎖状或は散開形、長さ 30~120 μ 、分生胞子球は 18~30 μ 又は 35 μ 長さ刺状粗面、又電子顕微鏡像 (Fig E 25) にても長さ刺状粗面

スティープ入培養に於ける生落の発育は 25°C にて 5 日目 26~31 mm, 10 日目 52~59 mm, 20 日目 50~70 mm, 30°C, 10 日目 48~60 mm, 37°C 発育不能、他の諸特性は同上、

亜硝酸入培養にてはソッヘック大同様に良好な生育を示す

本菌株は土壌より分離さる。

25. *Penicillium melinii* Thom

Colonies on Czapek agar growing rather slowly or rapidly spreading, attaining a diameter of 51 to 52 mm in 10 to 12 days at 25°C (Fig C-25); about 45 to 50 mm at 30°C; seldom growing at 37°C, (growing very well on NO₃-medium); velvety or velutinous, close-texture, consisting of a tough basal felt bearing abundant conidial structures in most strains, strongly wrinkled in radial pattern, raised in central area, growing margin narrow, white, 15~20 mm wide shading quickly to yellow-green or dull green shades near Andover, gnaphalium becoming gray-green to deep grayish olive; odor moldy, not pronounced; exudate lacking or abundantly, orange yellow to deep brown shades; reverse yellow to orange yellow, deep brown or purplish brown shades, with surrounding agar similar shades pigmented, penicilli variable, asymmetric conspicuously divaricate, occasionally monoverticillate but frequently consisting of a terminal group of diverging and unequal branches or metulae, conidiophores variable in length, 30 to 150 μ or 200 μ by 19 to 31 μ or 36 μ , with apices somewhat enlarged up to 31 to 44 μ , walls typically granular or tuberculate, branches variable, 10 to 30 μ by 19 to 36 μ metulae strongly divergent, 2 to 4 in vertical, mostly 89 to 156 μ or 20 μ by 18 to 25 μ or 34 μ with walls granular or slightly punctate; sterigmata in clusters of 5 to 10, compactly or somewhat divergent arranged, mostly 62 to 81 μ by 15 to 25 μ , broadest in central area with apices abruptly narrowed bearing conidia in chains up to 30 to 120 μ in length, loosely tangled or divergent; conidia globose, about 18 to 30 or 35 μ in diameter with walls aculeate, and the aculeate walls are shown by electron microscopy (Fig E-25)

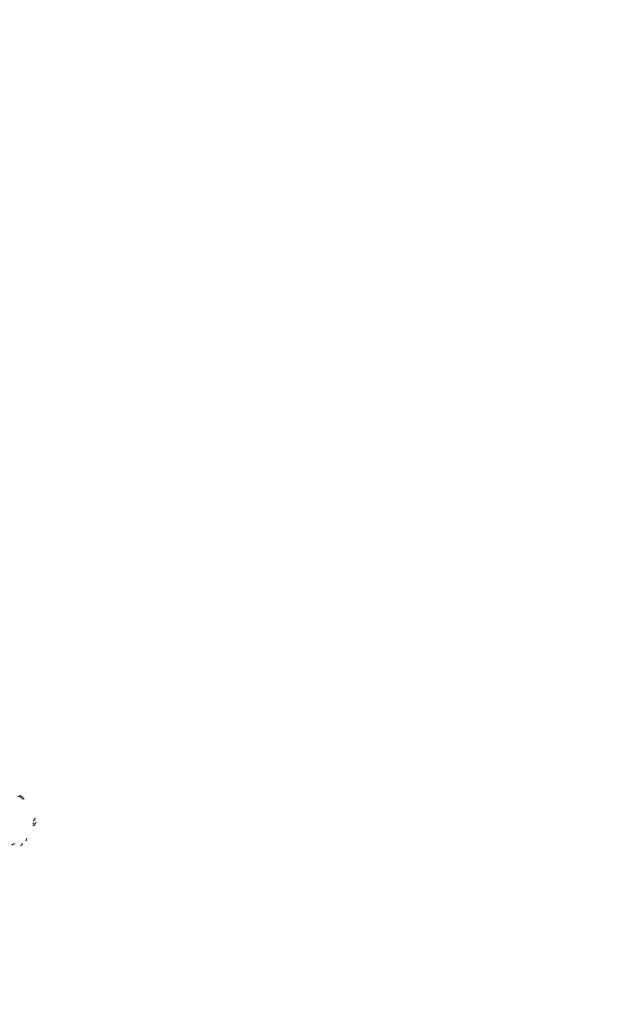
Colonies on steep agar growing more rapidly, about 52 to 59 mm in 10 to 12 days at 25°C, 48 to 60 mm at 30°C, seldom growing at 37°C, the others characters as described above

Strains of this species occurs from soils

*Thom C., The Penicillia p 273 1930

**Raper K B Thom C and Fennell D I A Manual of the Penicillia, pp 331 332 1949

***Abe, S., J Gen Appl Microbiology p 84 1956



26. *Penicillium citrinum* Thom



Fig. M-26 A. *Penicillium citrinum* Thom, FAT 513,
detail of penicilli



Fig. M-26 B. *Penicillium citrinum* Thom, FAT 513,
low power view of conidial chains

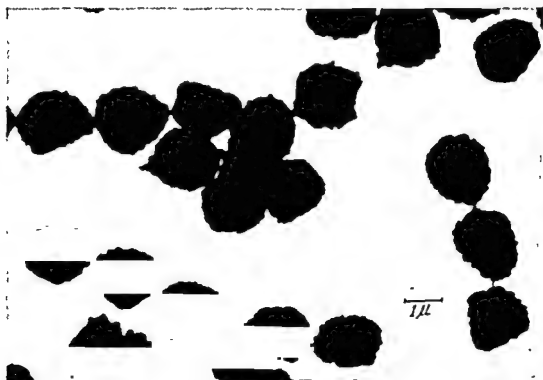


Fig. E-26. *Penicillium citrinum* Thom, FAT 513, conidia showing the slightly rough walls
and the globose to subglobose form

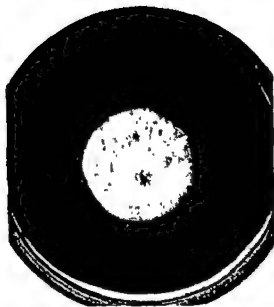


Fig C-26. *Penicillium citrinum* Thom, FAT 517, on Czapek agar, 10 days

26 *Penicillium citrinum* Thom

Colonies on Czapek agar growing restrictedly or rapidly, generally 32 to 48 mm in 10 to 12 days at days at 25°C (Fig C-26), 28 to 54 mm at 30°C; seldom growing at 37°C; (growing very well on NO_2 medium), typically or slightly furrowed in a radial pattern, velvety in most strains, more or less floccose in some, with a white margin about 0.2 to 2.0 mm in wide, conidial areas in blue green or yellow green shades near *Artemisia* Green or Bluish Gray Green, Dusky Yellowish Green, Blackish Green, becoming similar shades or grayish, olivish green shades; exudate lacking or limitedly, bright or pale yellow shades, pronounced mushroom odor in some strains, not made in others; reverse usually in bright yellow to orange, orange brown, and sometimes pinkish shades; with surrounding agar similar shades pigmented in most strains, colorless in some strains but usually pigmented on agar slant; penicilli typically biverticillate and asymmetric, seldom producing of branches (Fig M-26); conidiophores usually arising mostly from the substratum, mostly 60 to 130 μ or 230 μ by 2.1 to 2.8 μ or 3.7 μ , with apices somewhat enlarged up to 3.0 to 4.1 μ or 5.6 μ in diameter, with smooth or nearly so walled, metulae compact or somewhat divergent, 2 to 6 in verticil, mostly 10 to 16 μ or 23 μ by 2.1 to 3.4 μ or 4.3 μ , with apices larger up to 3.0 to 6.2 μ , sterigmata parallel or compact, 3 to 8 or 10 in verticil, measuring about 7.5 to 11.6 or 12.5 μ by 1.5 to 2.4 or 3.0 μ ; conidia typically globose to subglobose, 1.5 to 2.8 or 3.3 μ , with smooth or nearly so walls, and the slightly rough walls are shown by electron microscopy (Fig E-26), conidial chains typically column, up to 60 to 120 μ or 300 μ in length

Colonies on steep agar growing more rapidly, attaining a diameter of 37 to 57 mm in 10 to 12 days at 25°C, 41 to 64 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek

Strains of this species occurs from soils or dust borne contamination including cotton and other fabrics, dairy and food products, tobacco, leather goods, diseased rice, and various vegetable materials undergoing slow decomposition

*Thom C U S Dept Agr Bur Anim Ind Bull 118, pp 61 63 fig 22 1910, Op cit pp 250 257 fig 31 1930

**Raper, K. B., Thom, C and Fennell, D I., Op cit pp 345 350 1915

***Abe, S., J Gen Appl Microbiology 85 86 1956

ノアヘック実天培養に於ける集落の発育は 25°C にて 5 日目 12~26 mm, 10 日目 32~48 mm, (Fig C-26) 20 日目 41~73 mm, 30°C, 10 日目 28~54 mm, 37°C 特長的に発育不能, 集落は明確に又は軽微な放射状の皺を有し, 菌叢ビロード状, 又は幾分か綿毛状, 集落円周部は白色, 0.2~2.0 mm 巾, 分生胞子着生部は青緑又は黄緑色調, 順次灰緑, オリーブ緑色, 滲出物は欠, 又は僅小, 球, 或は薄黄色調, 集落裏面は通常輝黄色, 橙, 橙褐色, 又時には桃色調, 集落周辺皮又は同一色調, 又或る菌株にては無色なれども, 試験管斜面培養では前記色調; ヘノラスは不整斉輪生状, 分枝を有せず (Fig M-26), 分生胞子柄は通常基質より生育し, 60~130 μ 又は 230 μ × 2.1~2.8 μ 或は 3.7 μ , 頂端部幾分か膨大 3.0~4.1 μ 又は 5.6 μ , 滑面, 基底梗子緻密又は幾分か散開形に 2.6 カ群生, 10~16 μ 又は 23 μ × 2.1~3.4 μ 又は 4.3 μ , 頂端部膨大し 3.0~6.2 μ ; 梗子並行状又は散開に 3~8~10 カ群生, 7.5~11.6 μ 又は 12.5 μ × 1.5~2.4 μ 或は 3.0 μ , 分生胞子は球形又は亜球形, 1.5~2.8 μ 或は 3.3 μ , 滑面, 又電子顕微鏡写真 (Fig E-26) には僅小な粗面, 分生胞子連鎖は円柱状, 長さ 60~120 μ 又は 300 μ .

スティープス実天培養に於ける集落の発育は 25°C 5 日目 16~31 mm, 10 日目 37~57 mm, 20 日目 60~76 mm, 30°C 10 日目 41~64 mm, 37°C, 発育不能, 他の諸特性は同上, 非腐蝕性実天培養にてはノアヘック実天培養同様に良好なる発育を示す。

本菌株は各種の土壤, 堆肥, 糞, 又は他の糞物, 日常の食品, タバコ, 毛皮品, 絹衣類, 乾い加水分解を行いつつある各種の野菜類, 果人, 等より分離され, 分布が広い。

27. *Penicillium corylophilum* Dierckx

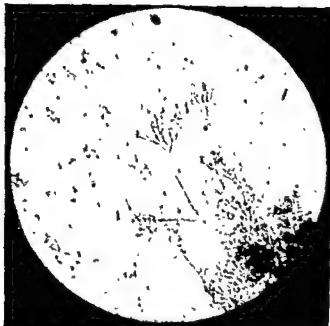


Fig. M-27 A. *Penicillium corylophilum* Dierckx, FAT 706, detail of penicilli.



Fig. M-27 B. *Penicillium corylophilum*, FAT 706, detail of the single penicillus

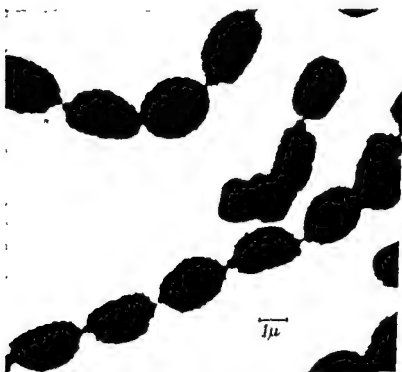


Fig. E-27. *Penicillium corylophilum* Dierckx, FAT 706, conidia showing the slightly rough walls and the elliptical to subglobose form



Fig. C-27. *Penicillium corylophilum* Dierckx FAT 644, on Czapek agar, 10 days

27. *Penicillium corylophilum* Dierckx

Colonies on Czapek agar growing somewhat restrictedly, attaining a diameter of 34 to 47 mm in 10 to 12 days at 25°C (Fig C-27), 31 to 45 mm at 30°C; seldom growing at 37°C; (growing very well on NO_2 -medium); typically velvety or slightly subfloccose, smooth, slightly or typically furrowed in a radial pattern, with a white margin 0.3 to 1.0 mm. in wide, conidial areas in blue green or yellow green shades near Dark Greenish Glauous or Pistachio Green, Andover Green, become olive brown or dark dull yellow Green, exudate limitedly or abundantly, colorless or yellow shades; odor evident but not distinctive, reverse in brownish or fuscous shades with surrounding agar colorless or dull yellow, or lighter similar shades; conidiophores arising mostly from the substratum, generally unbranched, 120 to 280 μ or 380 μ by 18 to 31 μ or 4.3 μ , with apices somewhat enlarged up to 30 to 4.4 μ , or 5.6 μ with walls smooth or nearly so, penicilli variable in form and dimensions, typically biverticillate and asymmetric (Fig M27A) but with monoverticillate structures sometimes predominating, penicilli typically consisting of 2 to 3 or 5 metulae, variable in length, mostly 10.6 to 18.7 μ by 2.1 to 3.7 μ , with apices somewhat enlarged up to 2.1 to 3.7 μ , each supporting a group of 4 to 8 sterigmata measuring about 7.5 to 12.5 μ by 1.5 to 2.5 μ , conidia elliptical to subglobose, mostly 18 to 31 μ by 1.5 to 2.5 μ , with walls smooth or nearly so, and the slightly rough walls are shown by electron microscopy (Fig E27), conidial chains tangled or loosely 30 to 90 μ or 190 μ in length (Fig M27B).

Colonies on steep agar growing somewhat rapidly, 40 to 67 mm in 10 to 12 days at 25°C, 30 to 57 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek

Straips of this species from soils and deteriorating materials

*Dierckx, R. P. Soc. Sci. Brux. 25: 86, 1901

**Bourge P. H. Monograph La Cellule 33 fasc. 1, pp. 266-268, Col. Pl. IX and Pl. XIV fig. 83, 1923

***Thom C., The Penicillia, pp. 254-255, 1930

****Raper, K. B., Thom C. and Fennell, D. I. Op. cit. pp. 341-345, 1949

*****Abe, S., J. Gen. Appl. Microbiology pp. 83-89, 1956

ソヘック大培養に於ける集落の発育は 25°C にて 5 日目 13~30 mm, 10 日目 34~47 mm (Fig. C-27) 20 日目 52~65 mm; 30°C, 10 日目 31~45 mm, 37°C 特異的に発育不能, 菌糸はピロート状又は僅かに棉毛状, 平滑, 僅かに或は明確に放射状の皺を有し, 集落周囲部は白色, 0.3~1.0 mm 巾, 分生胞子着生部は青緑色又は黄緑色調漸入すりー褐色或は暗黄緑色を呈す, 渗出物は欠或は豊富, 灰色或は黄色調, 集落表面は褐色, 又は褐色調, 集落周辺部又は無色或はくすんだ, 薄黄色調, 分生胞子柄は基質より直立し, 一般的に分枝せず 120~280 μ 或は 380 μ × 1.8~3.1 μ 或は 4.3 μ , 頂端部幾分か膨大し 3.0~4.4 μ 或は 5.6 μ , 前面, ヘニラスは形, サイズは変化に富み, 不整斉輪生状, 時々串輪生状様ヘニラスが多い, 基枝梗子は 2~3, 時に 5ヶ群生し, 10.6~18.7 μ × 2.1~3.7 μ , 頂端部幾分か膨大し, 2.1~3.7 μ , 梗子 4~8 カ群生し, 7.5~12.5 μ × 1.5~2.5 μ , 分生胞子柄柄又は垂珠形, 18~31 μ × 1.5~2.5 μ , 前面, 電子顕微鏡写真 (Fig E27) にては 0.1 μ 以下の微小なる粗面, 分生胞子連鎖は粒状, 或は円柱状, 長さ 30~90 μ 又は 190 μ (Fig M27B)

ステープル大培養に於ける集落の発育は 25°C にて 5 日目 18~38 mm, 10 日目 40~67 mm 20 日目 57~75 mm 30°C, 10 日目 30~57 mm, 37°C 発育不能, 他の諸性質は同じ
赤腐敗菌大培養にてはソヘック大培養同様良好なる発育を示す

本菌株は土壌又は各種腐敗物より分離する

28. *Penicillium paxilli* Bainier

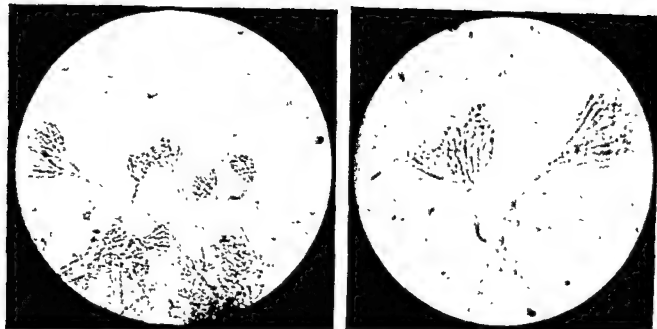


Fig. M-28 A, B. *Penicillium paxilli* Bainier, FAT 1286, detail of penicilli.

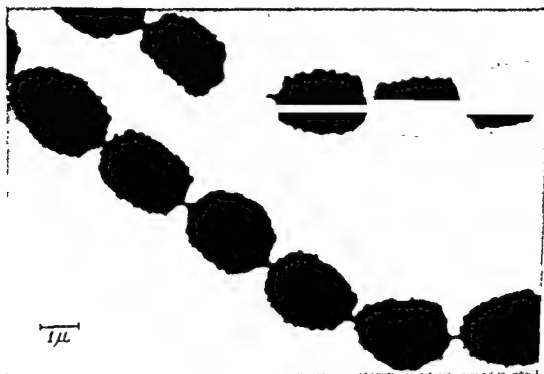


Fig. I-28. *Penicillium paxilli* Bainier, FAT 1286, conidia showing the slightly rough walls and the elliptical to ovate form.

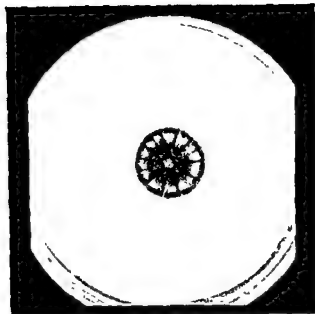


Fig. C-28 *Penicillium paxilli* Bainier, FAT 1286, on Czapek agar, 10 days

28 *Penicillium paxilli* Bainier

ノアヘック大天培養に於ける実落の発育は 25°C にて 5 日目約 16 mm, 10 日目約 30 mm (Fig C-28), 20 日目, 約 47 mm, 30 C 10 日目約 22 mm, 37°C 特長的に発育不能、菌叢はピロート状、平面又は放射状の叢があり、実落門周縁は白色、約 0.2 mm 巾、分生胞子着生部は暗又はグスンダ黄緑色調、順次暗オリーブ緑色を呈す、分泌物は微小又は豊富、無色；実落裏面はくすんだ黄色調、実落周辺々天は無色、ヘニラスは不整斉輪生状、併し分枝は有せず (Fig. M-28), 分生胞子柄は基質より縦直に直立し、又時々気筒より分枝し生ずす、120~240 μ \times 3.1~4.0 μ , 頂端部幾分か膨大 4.0~4.7 μ , 背面、基底は 5~8, 縦直に群生、9.3~12.5 μ \times 2.8~3.6 μ , 均一なサイズで、又頂端部僅かに膨大し、3.0~4.3 μ , 梗は縦直に 4~6 カ密生、8.0~10 μ \times 2.1~2.5 μ , 分生胞子は楕円又は卵形、2.5~3.4 μ \times 1.8~2.5 μ , 滑面、電子顕微鏡写真 (Fig E-28) には微小 (0.1 μ 以下) な粗面、分生胞子連鎖は螺旋状又は散開状、長さ 60~180 μ

マレーブ大天培養に於ける実落の発育は 25°C にて 5 日目約 20 mm; 10 日目約 35 mm, 20 日目約 48 mm, 30 C 10 日目約 34 mm; 37°C 発育不能、他の諸特性は同一

亜硝酸大天培養に於いてはノアヘック大天同様に良好なる発育を示す。

ト同様は土壌及び腐敗物より分離さる、

Colonies on Czapek agar growing rather restrictedly, attaining a diameter of about 30 mm. in 10 to 12 days at 25°C (Fig C-28), about 22 mm at 30°C, seldom growing at 37°C, (growing very well on NO₂-medium); velvety, plane or radial furrowed, with a white margin about 0.2 mm in width, conidial areas in dark or dull yellow green shades near Pea Green, Sage Green, becoming darker olive green shades near Andover Green; exudate limitedly or abundant, colorless; odor "moldy", not pronounced; reverse in dull yellow shades, with surrounding agar colorless; penicilli asymmetric and biverticillate, but seldom producing branches (Fig M-28), conidiophores borne in a dense stand arising primarily from the substratum, sometimes as branches from aerial hyphae, variable in length but commonly 120 to 240 μ by 3.1 to 4.0 μ , with apices somewhat enlarged up to 4.0 to 4.7 μ in diameter, with walls smooth or nearly so; metulae compact, 5 to 8 in verticil, mostly 9.3 to 12.5 μ by 2.8 to 3.6 μ , uniform in diameter or with apices only slightly enlarged, up to 3.0 to 4.3 μ in diameter, sterigmata compact, 4 to 6 in verticil, mostly 8.0 to 10 μ by 2.1 to 2.5 μ , conidia elliptical or ovate, mostly 2.5 to 3.4 μ by 1.8 to 2.5 μ , with walls smooth or nearly so, and the slightly rough walls are shown by electron microscopy (Fig E-28), and the conidial chains tangled or divergent, up to 60 to 180 μ in length.

Colonies on steep agar growing somewhat more rapidly than on Czapek, about 35 mm in 10 to 12 days at 25°C, about 34 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek.

Strains of this species occurs from soils and deteriorating materials

*Bainier, G. Bul Soc Mycol France 23 95 96, Pl X, figs 1 & 1907

**Thom, C. The Penicillia, pp 294 296 1930

***Raper, K. B., Thom, C and Fennell, D I., Op cit pp 414 416 1949

****Abbe S J Gen Appl Microbiology p 90 1956

29. *Penicillium chrysogenum* Thom

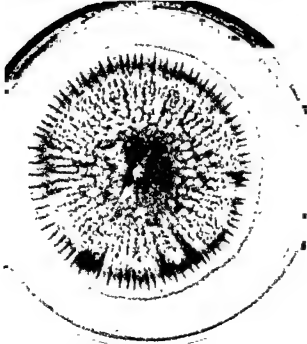


Fig. C-29A. *Penicillium chrysogenum* Thom, FAT 533, on Czapek agar, 10 days

ソヘーグア大培養に於ける集落の発育は 25°C, 5 日 19~40 mm, 10 日 37~58 mm. (Fig C-29 A), 20 日 46~73 mm; 30°C, 10 日 27~47 mm; 37°C 発育不能; 集落表面は車輪の如き放射状の皺があり、菌糸はピロード状又は短限成は僅かに網目状、集落内周縁は白色、0.8~3.0 mm 巾; 分生胞子着生は多くの菌株にては全面的に、或る菌株にては黄又はクリーム色の菌糸が中心部に残る傾向がある、分生胞子着生部は黄緑、又は青緑色調、時々同一色調か又はあせた黄緑又は青緑色調を呈す、分泌物は僅小又は豊富、

29. *Penicillium chrysogenum* Thom

Colonies on Czapek agar growing rapidly, attaining a diameter of 37 to 58 mm. in 10 to 12 days at 25°C (Fig C-29 A), 27 to 47 mm at 30°C; seldom growing at 37°C; (growing little or not on NO₂ medium), surface conspicuous radial furrows which lend to the colony a wheel like appearance, velvety or velutinous subfloccose, with a white margin about 0.8 to 3.0 mm in wide, heavily sporing throughout in most strains, in others often showing some tendency to remain sterile in central areas with vegetative mycelium yellowish to cream colored, conidial areas in yellow green or blue green shades near Dark American Green, Dark Porcelain Green, Dark Russian Green, Bluish Gray Green, becoming to similar shades or Andoverer green or Artemisia Green or Lily Green; exudate limitedly or abundantly, pale or bright yellow shades, odor lacking or indefinite; reverse bright or dull yellow shades throughout and some times pale brownish in central areas, with surrounding agar strongly or pale yellow shades pigmented; penicilli biverticillate and asymmetrical, commonly showing one or more branches in addition to the main axis (Fig M-29) terminating in verticils of 2 to 5 or 7 metulae bearing sterigmata; conidial chains usually in well-defined columns commonly 60 to 200 μ in length; conidiphores arising primarily from the substratum in a dense stand, variable in length, commonly

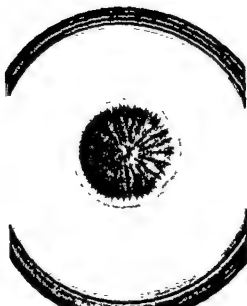


Fig. C-29B. *Penicillium chrysogenum* Q 176, on Czapek agar, 10 days

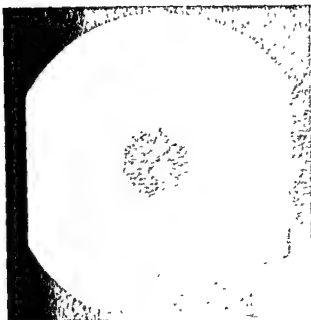


Fig. C-29C F.



Fig. C-29D *Penicillium chrysogenum* Q 176 albino type strain, on Czapek agar, 10 days



Fig. C-29E. *Penicillium chrysogenum* Q 176 yeast type strain, on Czapek agar, 10 days

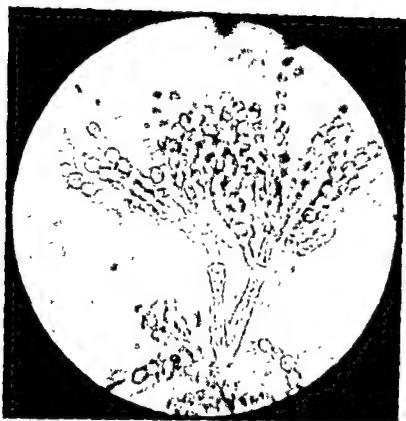


Fig. M-29 C. *Penicillium chrysogenum* Q 176. detail of the single penicillus

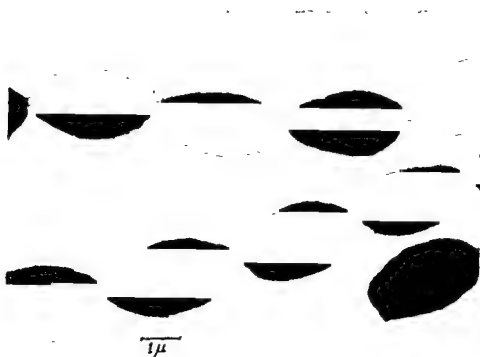


Fig. L-29. *Penicillium chrysogenum* Thom. FAT 517 media showing the "neck" or "waist" of the spores and the elliptical or ovate form



Fig. M-29A. *Penicillium chrysogenum* Thom, FAT 533, low power view of colony section showing typically velvety character of texture



Fig. M-29B. *Penicillium chrysogenum* Thom, FAT 533, detail of penicilli

30. *Penicillium notatum* Westling



Fig. M-30 A. *Penicillium notatum* Westling, FAT 578, detail of a single penicillus.



Fig. M-30 B. *Penicillium notatum* Westling, FAT 1079, detail of penicilli.

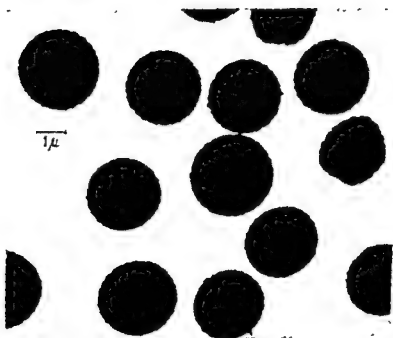


Fig. E-30. *Penicillium notatum* Westling, FAT 619, conidia showing the smooth or nearly so walls and the glabrous to subglabrous form.

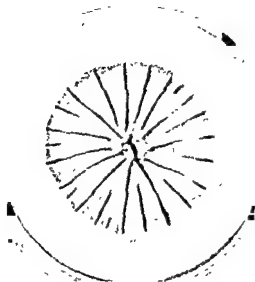


Fig. C-30. *Penicillium notatum* Westling. FAT 578, on Czapek agar, 10 days.

ノヘック大入培養に於ける生落の発育は 25°C にて 5 日 11 16~30 mm, 10 日 11 39~70 mm (Fig. C-30), 20 日 11 58~72 mm; 30°C, 10 日 11 32~59 mm; 37°C, 発育不能; 菌糸はビロート状又は短根状。分生胞子系は微細構造を豊富に行つ綿密な菌糸を形成する基礎文路向条帯を有し、通常顕著な小輪幅の放射状線を有す。分生胞子系は著しく、生落の菌糸は黄又は黄色。1~2 mm 巾、又成る菌糸にては分生胞子系生糸が多くなく、中心部が黄色調; 分生胞子系生糸は青緑又は黄緑色調、順次くすんだ成はオリーブ緑色調を呈す; 産出物は付小又は巻包、径々 1~3 mm の直徑人の水滴となり、クリーム黄色又は薄褐色調、生落表面は時々は薄黄色に全面呈色又時に中心部薄褐色調、生落周辺大入は著しい輝又は薄黄色調; 分生胞子系は基質又は基礎文路菌糸帯より直立し、長さば変化に富み 120~220 μ ~500 μ \times 2.5~3.7 μ ~6.8 μ , 頂端部が幾分膨大し 2.8~4.3 μ ~7.5 μ , 表面、ヘミナスは小や直輪状、他の群生を有つた基礎文路の一群生を小すか、一段又は数段の分枝を有す (Fig. M-30), 分生胞子系は同様に、又は短根状、長さ 60~130 μ , 分枝はサイズ小なり、6.3~31 μ \times 2.5~4.3 μ , 基礎文路は通常 2~6 μ 群生、散生又は不明確な散生状に散り、6.2~15.6 μ \times 2.1~4.3 μ ; 他は一般的な散生に 3~8 μ 群生、7.5~10.6 μ \times 1.8~3.3 μ , 分生胞子系は短根状は中珠系、2.1~3.2 μ \times 3.7 μ , 表面、分生胞子系は短根状 (Fig. E-30) には付小な粗面。

スライフ大入培養にては幾分かノヘック大入より生落の発育大、25°C にて 5 日 11 20~40 mm, 10 日 11 48~70 mm, 20 日 11 64~78 mm, 30°C 10 日 11, 41~65 mm, 37°C 発育不能。菌糸はビロート状、巻包は分生胞子系を小し、通常ノヘック大入培養より厚かに濃褐色調、著しい放射状線を有し; 産出物は巻包、生落表面 周辺大入はノヘックより濃褐色調、他の諸性質は同上。

亜硝酸大入培養にては特長的に発育不能。

本菌の分布は広く、1 環、腐敗物より数多く増殖する。

30. *Penicillium notatum* Westling

Colonies on Czapek agar growing fairly rapidly in most strains, attaining a diameter of 39 to 70 mm. in 10 to 12 days at 25°C (Fig. C-30), 32 to 59 mm. at 30°C; seldom growing at 37°C; (growing little or not on NO_2 -medium); velvety or glutinous, consisting of a fairly close-textured basal felt bearing abundant conidial structures, commonly azonate, usually showing conspicuous radial furrows to produce a wheel-like appearance, heavily sporing throughout except for a white to yellowish growing margin 1 to 20 mm wide in most strains, in others rather light-sporing and yellowish in colony centers, conidial areas in blue-green or typical yellow-green shades near Hays Green, Winter Green, Dark Russian Green, Dark Yellowish Green, Bluish Gray Green, becoming darker similar shades or dull or olivish shades; exudate limited or abundant, often collecting in large drops 1 to 3 mm in diameter, clear yellow to light brownish shades; odor not pronounced, reverse bright or pale yellow shades throughout and sometimes pale brownish shades in central areas, with surrounding agar strongly bright or pale yellow shades; conidophores arising primarily from the substratum or basal felt, variable in length, 120 to 220 μ or 500 μ by 2.5 to 3.7 μ or 6.8 μ , with apices somewhat enlarged up to 2.8 to 4.3 μ or 7.5 μ , with smooth or nearly so walled, penicilli asymmetrical and biverticillate, sometimes showing one or more fertile branches but commonly consisting of a simple terminal verticil of metulae bearing clusters of sterigmata, (Fig. M-30), and conidial chains up to 60 to 130 μ or 260 μ in length, column or loosely tangled, branches variable in size, mostly 6.3 to 31 μ by 2.5 to 4.3 μ , metulae usually in groups of 2 to 6, variable in length, compact or loosely compact, ranging from 6.2 to 15.6 μ by 2.1 to 4.3 μ , sterigmata commonly borne in verticils of 3 to 8, compact, mostly 7.5 to 10.6 μ by 1.8 to 3.3 μ ; conidia globose to subglobose, mostly 2.1 to 3.2 μ or 3.7 μ in diameter, with smooth or nearly so, and the slightly rough walls are shown by electron microscopy (Fig. E-30). Colonies on steep agar somewhat more rapidly, 48 to 70 mm in 10 to 12 days at 25°C, 41 to 65 mm 30°C, seldom growing at 37°C; strictly velvety, sporing throughout, usually in slightly darker shades, conspicuously furrowed in a radial pattern; exudate abundantly produced, reverse and agar in duller shades than on Czapek, the other characters as on Czapek.

Strains of this species occurs from soils and deteriorating materials in nature. And the species widely distributed in nature.

*Westling R. Arkiv. för Botanik II 55, 95 97, figs 17, 99 1911

**Bourge, Ph. Monograph, La Cellule 33 fasc 1, pp 179 181, Col Pl IV abd Pl VIII fig 37 1923

***Thom, C. The Penicillia pp. 264 265, 1930

****Raper, K. B., Thom, C. and Fennell, P. L. Op. cit., pp 367 371

*****Abu, S., Op. cit 91 95 1956

31. *Penicillium oxalicum* Currie and Thom



Fig. M-31 A. *Penicillium oxalicum* Currie and Thom, FAT 265, detail of penicilli.



Fig. M-31 B. *Penicillium oxalicum* Currie and Thom, FAT 265, detail of penicilli.



Fig. E-31. *Penicillium oxalicum* Currie and Thom, FAT 1185, conidia showing the slightly rough walls and the elliptical form.

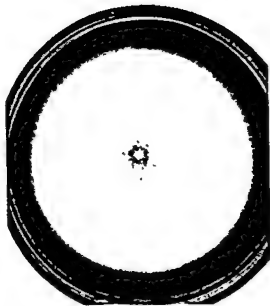


Fig C-31. *Penicillium oxalicum* Currie and Thom, FAT 524, on Czapek agar, 10 days

ノアヘック大入培養に於ける集落の発育は 25°C にて 5 日目 20~45 mm, 10 日目, 61~83 mm (Fig C-31), 20 日目 76~85 mm; 30°C, 10 日目, 71~80 mm, 37°C, 10 日目 6~65 mm; 多くの菌株にては平面的又は平凸, 或る菌株にては不規則な皺があり, 菌叢はヒロード状又は類似様, 分生胞子の着生は著しく多く, 培養器に少し衝動をうけても成熟後には特徴的に分生胞子塊が壊れ落ちる, 集落周囲部は白, 緑黄色或は時に檸檬色, 10~20 mm 巾; 分生胞子着生部は暗黄緑色或はオリーブ緑色群, 順次濃オリーブ緑色又は黒オリーブ色調を呈す, 分泌物は久又は帯紅, 無色, 集落表面は全面黄色調又は緑, 黄, 棕色調を部分的に呈色, 集落周辺部又は灰色, 順次薄黄色に着色, ヘンノラスは不整斉輪状 (Fig M-31); 分生胞子柄は縦断に直立し, 80~200~380 μ \times 3.2~4.7 μ , 根端部は幾分か膨大し 3.5~6.2 μ , 滑面, 分枝は久, 又は単立し, 13~24 μ \times 3.0~4.5 μ , 基底短くと同レベルに幾々着生す, 基底短くは通常 2~4 μ 行状様に着生, 13~25 μ \times 2.9~4.1 μ , 根端部は 3.0~5.3 μ , 梗子は行状様 4~8 μ 群生し, 9.1~15.6 μ \times 2.3~4.0 μ , 根端部は多少粗い, 分生胞子は楕円形, 3.4~5.4 μ \times 2.5~4.0 μ , 滑面, 又電子顕微鏡写真 (Fig E-31) にては 0.1 μ 以下の小さな粗面, 分生胞子連鎖は円柱状, 長さ 60~300~400 μ

スティーフ大入培養にての集落の発育は 25°C にて 5 日目 26~55 mm 10 日目 75~83 mm, 20 日目 80~85 mm, ノアヘック大入培養よりも一般分生胞子の着生多く且成熟後の分生胞子柄は地盤の如く容易に折れ易い, 他の諸特性は同し

亜硝酸大入培養にては ノアヘック大入同様, 発育良好

本菌株より 葉 柄葉木 病変果物類等より屢々分離さる

31. *Penicillium oxalicum* Currie and Thom

Colonies on Czapek agar broadly spreading, attaining a diameter of 41 to 83 mm in 10 to 12 days at 25°C (Fig. C-31); 71 to 80 mm at 30°C; 6 to 65 mm, at 37°C; (growing very well on M1) medium; generally plane or smooth but in some strains irregularly furrowed strictly velvety or velutinous, heavily sporing with conidia forming a deep layer which, when mature, characteristically falls away en masse. If the culture vessel is tapped, with white, pale yellow or sometimes orange pink margin 10 to 20 mm wide, shading darkish yellow green or olive green shades near Dusky Olive Green, Dull Blackish Green, Dusky Yellowish Green, becoming Dusky Olive Green or Dark Ivy Green; exudate lacking or abundantly, colorless; no odor; colony reverse generally in yellowish shades throughout or more or less low, orange shades toward the center, with surrounding agar colorless, becoming pale yellow shades pigmented; penicilli typically bluish-lilac and asymmetric (Fig. M-31); conidial chains arising from the substratum in a close stand to produce a velvety colony surface, mostly 90 to 200 μ in 300 μ up to 35 to 62 μ in diam.

usually in groups of 2 to 4, basally truncate 25 μ by 29 to 41 μ , basally parallel, 11 to 13 μ borne in terminal clusters of 4 to 8, basally parallel, mostly 91 to 175 μ by 23 to 40 μ with conidium bearing tips more or less tapered; conidia typically elliptical, ranging from 3.4 to 5.4 μ by 2.5 to 4.0 μ , with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig. E-31); conidial chains columnar, up to 60 to 300 or 400 μ in length.

Colonies on steep agar grow more laterally than on Czapek, 78 to 83 mm in 10 to 12 days at 25°C; 75 to 83 mm at 30°C; 19 to 60 mm, at 37°C, more heavily sporing than upon Czapek agar, breaking off readily as crusts when mature; the other characters as on Czapek.

Strains of this species occur from manure, leaves, disease rice, diseased fruits, etc.
Currie, J. M. and Thom, C. Jour. Food Res. 239, Fig. 1, 1935.
Thom, C. Op. cit. pp. 247-250, Fig. 31.
Raper, K. B., Thom, C. and Fennell, C. pp. 21-22, 1935.
Abt. S. J. Gen. Appl. Microbiol.

32. *Penicillium digitatum* ~~Sacc.~~



Fig. M-32. *Penicillium digitatum* Saccard, FAT 1331, detail of penicilli.



Fig. L-32. *Penicillium digitatum* Saccard, FAT 1331, conidia showing the slightly rough walls and the cylindrical or elliptical form.

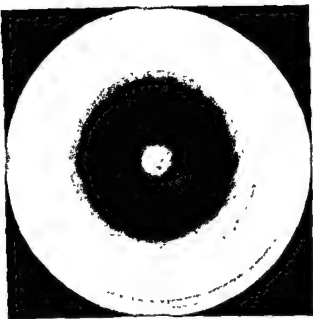


Fig. C-32 *Penicillium digitatum* Saccardo, FAT 1331, on steep agar, 10 days

ノアヘック寒天培養に於ける集落の発育は特異的に不良にて平面的で且つ分生胞子の菌生部僅小にて粗雑なる集落を形成す。25°C, 5日目約10日目約30mm; 20日目約35mm, 30°C, 10日目約25mm, 37°C, 発育不良, 集落円周部無肥子菌生部は中広く, 約10~15mm巾; 菌叢ピロート状, 分生胞子菌生部はくすんだ黄緑色, 集落表面は灰色, 順時暗緑オリブ色を呈し; 集落周辺部又は灰色; 他の諸性質は下記の如し,

ステープル寒天培養に於ける集落の発育は良好にて, 25°C 5日目約35mm, 10日目約65mm, (Fig C-32), 20日目約75mm, 30°C 10日目約60mm; 37°C 発育不能, 菌叢ピロート状, 平面, 平滑, 基礎菌糸帯の発育良好, 集落円周部は白色, 約10~20mm巾, 分生胞子菌生部はくすんだ黄緑色調, 順次灰オリブ色又は暗緑オリブ色を呈す, 滲出物は乏, 集落表面は灰色又は薄いか又はくすんだ褐色或はオリブ色調; 集落周辺部又は灰色; ヘニラスは不整齊輪生状, 構造は雑多で且サイズは変化に富む (Fig M-31), 分生胞子柄は基礎菌糸或は基礎交錯菌糸帯より直立し, 60~200 μ ×40~55 μ , 頂端部幾分か膨大し, 42~61 μ 巾, 滑面, 分枝は変化に富み, 15~28 μ ×24~57 μ , 基礎梗子は形, サイズ変化に富み, 15~31 μ ×25~56 μ , 多少散開状に3~5ヶ群生, 頂端部30~60 μ , 梗子は均等で変化に富み, 15~29 μ ×25~45 μ , 幾分か散開状に3~5ヶ群生; 分生胞子は楕円形又は楕円形, 37~94 μ ×25~44 μ , 梗々一対大型具在, 滑面, 又電子顕微鏡写真 (Fig E-32) にては0.1 μ 以下の微小な粗面, 分生胞子連鎖は平行状長き10~300 μ

亜硝酸寒天培養にては多少発育を示す,

本菌種は腐敗果物特にレモン, オレンジ, 蜜柑類より分離さる

32. *Penicillium digitatum* Saccardo

Colonies on Czapek agar growing rather restrictedly, attaining a diameter about 30 mm in 10 to 12 days at 25°C; (growing fairly well on NO₂ medium), plane and sparsely colonies produced, with white sterile margin, broadly, about 10 to 15 mm. wide, velvety, conidial areas in dull yellow green shades near Vettiver Green; reverse colorless, becoming dark olive buff, with surrounding agar colorless, the other characters see steep agar below.

Colonies on steep agar growing luxuriantly spreading, attaining a diameter of about 65 mm in 10 to 12 days at 25°C, (Fig C-32) about 60 mm at 30°C; seldom growing at 37°C; velvety, plane or smooth, consisting of a well-developed vegetative mycelium at the agar surface upon which are borne abundant conidial structures, with a white margin about 10 to 20 mm wide, sporulating areas in dull yellow-green shades near Vettiver Green, becoming grayish olive or Dark Olive Buff; no exudate produced; odor pronounced, strongly aromatic, suggestive of decaying citrus fruits; reverse unicolor or showing light to dull brown or Dark Olive Buff, with surrounding agar colorless; penicilli asymmetrical and biverticillate but varying greatly in dimensions and complexity (Fig M-32), conidiophores arising from submerged hyphae, or from the basal mycelial felt, commonly ranging from 60 to 200 μ by 40 to 55 μ , with apices somewhat enlarged up to 42 to 61 μ in diameter, with smooth or nearly so walled, branches variable, mostly 15 to 28 μ by 24 to 57 μ ; metulae variable in form and dimensions, commonly ranging from 15 to 31 μ by 25 to 56 μ , more or less divergent, 3 to 5 in verticils, with apices 30 to 60 μ , sterigmata equally variable and ranging from 15 to 29 μ by 25 to 45 μ , somewhat divergent, 3 to 5 in verticils, conidia cylindrical or elliptical, mostly 37 to 94 μ by 25 to 44 μ , occasionally more larger, with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-32), conidia chains loosely parallel, up to 10 to 300 μ in length

Strains of this species isolated from spoiling citrus fruits, lemon and oranges

*Saccardo D, Mycotheca Italica no. 986, Herbarium U S Dept Agr Sylloge Funorum, vol IV 78

**Thom, C U S Dept Agr Bur Anim Ind Bull 118, pp 31 33, fig 3 1910, and The Penicillia pp 242 245, fig. 29 and 30 1930

***Raper, K B, Thom, C and Fennell, D I, Op Cit, pp 336 330 1949

****Abe, S J Gen Appl Microbiology p 97 1956,

33. *Penicillium roqueforti* Thom

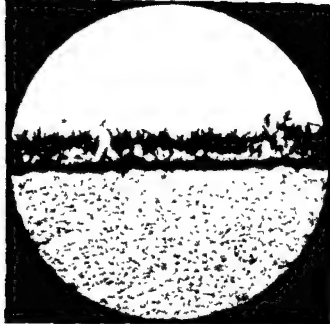


Fig. M-33A. *Penicillium roqueforti* Thom, FAT 731, low power view of colony section showing typically velvety character of texture.



Fig. M-33B. *Penicillium roqueforti* Thom, FAT 513, low power view of colony section showing long conidiophores directly arising from substratum.



Fig. M-33C. *Penicillium roqueforti* Thom, FAT 731, detail of penicilli.

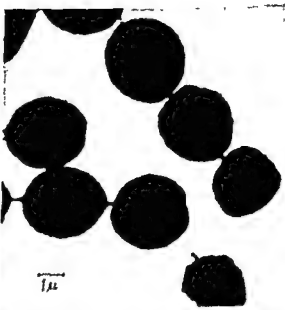


Fig. L-33. *Penicillium roqueforti* Thom, FAT 1134, detail showing the slightly rough walls of the glabrous or subglabrous cells.

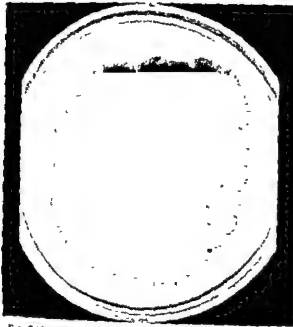


Fig. C-33 *Penicillium roqueforti* Thom, FAT 543, on Czapek agar, 10 days

フアヘック寒天培養に於ける集落の発育は25°Cにて5日目18~46 mm, 10日目46~76 mm. (Fig C-33), 20日目59~80 mm; 30°C, 10日目32~67 mm; 37°C, 発育不能, 分生胞子の産生豊富, 菌叢はピロート状, 又は類似状, 平滑, 又は平面的に発育或る傾斜にてはかるい放射状線があり, 集落内周部は白色, 10~30 mm 巾, 又或る菌体にては蜘蛛状を呈す, 分生胞子着生部は黄緑又は青緑色調で, 順次くすんだ緑色, 暗オリーブ, オリーブ褐色を呈す; 産出物は欠又は豊富, 無色; 集落裏面は無色又は緑色, 稀或は褐色色調, 集落周辺寒天は常に無色, ヘニノラスは変化に富み, 不整有輪生状 (Fig M-33); 分生胞子柄は変化に富み, 長又は短く, 60~120 μ , 又は 700 $\mu \times 36 \sim 56 \mu$ 頂端部は幾分か拡大 39~75 μ , 大端又は顆粒状粗面, 分枝は125~31 $\mu \times 31 \sim 48 \mu$ 同上粗面; 芽胞梗子や・粗面又は幾分か散開状に2~6ヶ群生, 84~118 $\mu \times 24 \sim 44 \mu$, 顆粒状, 又は斑点状粗面, 頂端部30~56 μ , 梗子は幾分か密に3~7ヶ着生し, 90~125 $\mu \times 21 \sim 35 \mu$; 分生胞子球形又は亜球形, 28~50 μ , 平滑, 又電子顕微鏡写真 (Fig E-33) にては0.1 μ 以下の極小な粗面; 分生胞子連鎖は似円柱状又は紡錘状, 長さ60~120 μ 又は200 μ

ステープルス培養に於ける集落の発育はフアヘック寒天培養よりも少しく早いか又は遅い; 25°Cにて5日目25~48 mm, 10日目40~81 mm, 20日目60~88 mm, 30°C 10日目, 30~68 mm; 37°C, 発育不能; 平面又は平滑又は放射状の線を有し, 或る菌体にては不規則; 菌の栽培法は同上。

菌叢の寒天培養に於けるフアヘック寒天培養と同様の発育を示す。

本菌株はロックエフェールチーズ, 上坂, クバコ, 不規則なより分離される。

33. *Penicillium roqueforti*

Colonies on Czapek agar or broadly spreading to 76 mm in 10 to 12 days at 25°C, 32 to 67 mm at 30°C (growing very well) or 32 to 67 mm at 37°C, some strains slightly white margin 10 to 12 days, appearing arachnoid, some green or blue green, Dark Yellowish Green, becoming to bull, Deep Olive, Olive, lacking or abundant or pronounced, slight, in shades of colorless or penicilli variable in pattern, biverticillate (Fig M-33), conidophore, short or long, mostly 60 to 120 or 700 μ , by 10 to 56 μ , with apices somewhat enlarged up to 39 to 75 μ in diameter, with protuberulate or granular walled, branches variable, 125 to 31 μ by 31 to 48 μ with walls similar above, metulae loosely compact, or somewhat divergent, 2 to 6 in verticils, mostly 84 to 16 μ by 24 to 44 μ , with walls granular or punctate, with apices 30 to 56 μ , sterigmata loosely compact, 3 to 7 in verticils, mostly 90 to 125 μ by 21 to 35 μ , conidia globose or subglobose, commonly ranging from 28 to 50 μ , smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig F-33), conidial chains loosely column or tangled, up to 60 to 120 μ or 200 μ in length

Colonies on steep agar growing more rapidly or slowly than on Czapek, 40 to 81 mm in 10 to 12 days at 25°C; 30 to 68 mm, at 30°C, seldom growing at 37°C, plane or smooth, typical radial furrowed or some strains irregular, the other characters as on Czapek

Strains of this species isolated from Roquefort cheese, souls, tobacco and spoiling tablets

*Thom, C. J., S. Dept Agr Bur Anim Ind., Bull 82, pp 35-36, fig 2 1906, also ibid, 115, p 34, 1910, The Penicillia, pp 277-279, fig 33 1930

**Paper, K. B., Thom, C. and Fennell, D. I., Op cit pp 395-401 1943.

***Abe, S. J Gen Appl Microbiology 98 99 1956



34. *Penicillium casei* Staub

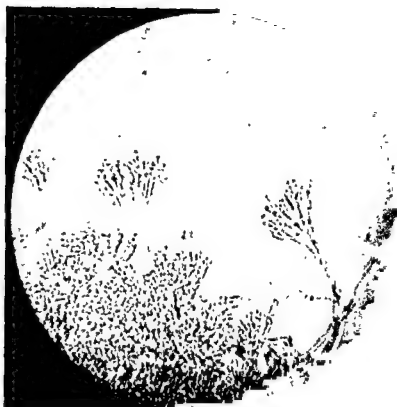


Fig. M-34. *Penicillium casesi* Staub, FAT 817, detail of penicilli



Fig. E-34. *Penicillium casesi* Staub, FAT 1232, conidia showing the slightly rough walls and the elliptical to subglobose form



Fig C-34. *Penicillium casei* Staub, FAT 817, on Czapek agar, 10 days

ソーヘック実天培養に於ける生落の発育は 25°C にて 5 日目 20~23 mm, 10 日目 40~66 mm (Fig C-34), 20 日目 45~68 mm; 30°C 10 日目 24~53 mm, 37°C 2~13 mm, 菌叢ピロート状, 又は類似, 放射状皺を有し, 分生胞子の着生多く, 生落円周部は白色, 0.5~1.5 mm 中; 分生胞子着生部は明るい又はくすんだ黄緑色調; 分泌物は僅小又は豊富, 無色又は薄黄色調; 生落表面は黄, 橙, 褐色調, 生落周辺部は鈍, 褐色調赤色; 分生胞子柄は硬く文様, 又は交錯基礎面糸帯より縦糸に直立し, 多くは 90~200 μ 又は 380 μ \times 3.2~5.6 μ , 頂端部は幾分か膨大, 4.0~7.5 μ , 大形, 又は顆粒状粗面; ヘニシラスは不整斉輪生状, 梗子を持った基底梗子が群生している分枝は一段式は数段に分枝し (Fig M34), 分生胞子連鎖は円柱状棒或は鏈状, 長さ 60~250 μ ~380 μ , 分枝はサイズ変化に富み, 9.3~15.6 μ \times 4.4~6.0 μ , 梗々分枝す, 基底梗子は縦糸様に 2~5 ケ群生し, 8.1~12.5 μ \times 2.8~4.4 μ 斑点又は顆粒状粗面; 梗子 3~5 ケ横糸様に着生, 6.8~9.3 μ \times 2.0~3.0 μ ; 分生胞子は楕円又は垂珠形, 3.1~3.9 μ \times 2.3~3.1 μ , 滑面, 電子顕微鏡写真 (Fig E34) にては 0.1 μ 以下の微小なる粗面,

ステーブ入培養に於ける生落の発育は 25°C にて 5 日目 23~27 mm, 10 日目 43~70 mm, 20 日目 65~72 mm, 30°C 10 日目 30~54 mm, 37°C 2~10 mm, 目の細い且著しい放射状の皺を有し, 分生胞子の着生著しく, 鮮黄緑色調, 順次濃ナリーブ緑色調を呈す, 他の諸性質は同上。

亜硝酸還元培地にては発育不能

本菌株は 1 塊又はチーズより分離さる。

34 *Penicillium casei* Staub

Colonies on Czapek agar growing rather rapidly, 40 to 66 mm. in 10 to 12 days at 25°C (Fig C-34), 24 to 53 mm. at 30°C; 2 to 13 mm at 37°C, (growing little or not on NO_2 medium), velvety or velutinous, typically radial furrowed, heavily sporing, growing marginal zone 0.5 to 1.5 mm wide, white, shading into fairly bright or dull yellow-green shades near Dark Dull Yellow Green, Danube Green, becoming Yew Green or Leaf Green; exudate limited or abundantly, colorless or light yellow shades, odor very faint or lacking; reverse in yellow to orange, brownish shades, with surrounding agar pinkish or brownish shades pigmented, conidiophores borne in a dense stand, arising mainly from a closely interwoven and tough basal mycelial felt, mostly 90 to 200 μ or 380 μ by 3.2 to 5.6 μ , with apices somewhat enlarged up to 4.0 to 7.5 μ , with protuberances or granular walled; penicilli asymmetric and biverticillate, typically consisting of one or more branches in addition to the main stem, each terminating in a cluster of metulae bearing sterigmata (Fig M-34) and spore chains loosely column or tangled, up to 60 to 250 μ or 380 μ in length, branches variable in size, mostly 9.3 to 15.6 μ by 4.4 to 6.0 μ , occasionally rebranched, metulae borne in groups of 2 to 5, loosely compact, mostly 8.1 to 12.5 μ by 2.8 to 4.4 μ , with punctate or granular walled, sterigmata borne in groups of 3 to 5, loosely compact mostly 6.8 to 9.3 μ by 2.0 to 3.0 μ , conidia elliptical to subglobose, mostly 3.1 to 3.9 μ by 2.3 to 3.1 μ , with smooth or nearly so, and the slightly rough walls are shown by electron microscopy (Fig E34).

Colonies on steep agar growing more rapidly, attaining a diameter of 43 to 70 mm in 10 to 12 days at 25°C, 30 to 54 mm. at 30°C, 2 to 10 mm at 37°C; closely and conspicuously furrowed in a radial pattern, heavily sporing, conidial areas bright yellow shades near Empire Green shades, becoming Dusky Olive Green, the other characters as on Czapek

Strains of this species isolated from soils and cheeses

*Staub, W., *Centbl f Bakt etc II* 31 454-466, 1911

**Thom, C., *Op cit*, p 270 1930

***Raper, K. B., Thom, C. and Fennell D. I., *Op cit*, pp 401-402 1949

****Abe, S., *J Gen Appl Microbiology* 100 101 1956

35. *Penicillium pseudo-casei* Abc

36. *Penicillium brevi-compactum* Dierckx



Fig. M-36. *Penicillium brevicompactum* Dierckx, FAT 1235, detail of a single penicillus.



Fig. E-36. *Penicillium brevicompactum* Dierckx, FAT 1235, conidia showing the delicately echinate or verruculose walls and the glabrous, light-colored



Fig. C-36. *Penicillium brevicompactum* Dierckx, FAT 1285 on Czapek agar, 10 days.

ノアヘック夫人培養に於ける集落の発育は25°Cにて5日目約8mm; 10日目約29mm (Fig C-36), 20日目約40mm; 30°C 10日目約32mm, 37°C, 発育不能; 菌叢はピロート状, 高さ0.8~1.0mm, 時々中心部隆起, 又時々放射状の叢を有す。分生胞子着生部はくすんだ黄緑色調 類灰緑色調を呈す, 滲出物は僅小, 黄又は橙褐色調, 集落表面は薄又はくすんだ黄色調, 集落周辺部又は薄黄色に着色; ヘニノラスは菌叢に不規則に分枝している, 1, 2, 又は以上の分枝を有し, 人々梗子, 基底梗子の群生を有す; 分生胞子連鎖は直行様, 長さ60~120 μ , 分生胞子柄は直立し, 多少硬い, 250~600 μ ×3.7~5.0 μ , 頂端部多少膨大4.6~6.2 μ , 小し粗面, 分枝6.2~17.6×3.1~5.6 μ , 基底梗子は3~4ヶ級糸に着生, 梗子に頂端部に近い膨大, 5.0~9.4 μ ×3.1~4.6 μ , 頂端部3.7~6.2 μ , 梗子は縦糸に又多少膨れ型に4~6ヶ群生, 7.5~10 μ ×2.1~3.0 μ 分生胞子球形又は亜球形, 2.1~3.4 μ , 滑面, 電子顕微鏡写真 (Fig E 36) にても幾分人刺状又は針状相面。

スティープ夫人培養に於ける集落の発育は25°Cにて5日目約12mm, 10日目約28mm, 20日目約35mm, 30°C 10日目約25mm, 37°C 発育不能, 他の諸性は同上。

亜硝酸夫人培養にては多少発育を小す。

本菌種は土壌より分離さる。

36 *Penicillium brevicompactum* Dierckx

Colonies on Czapek agar growing restrictedly, attaining a diameter of about 29 mm in 10 to 12 days at 25°C (Fig C-36); about 32 mm at 30°C; seldom growing at 37°C; (growing fairly well on NO_2 -medium); velvety, about 0.8 to 1 mm deep, often raised in central colony area, sometimes radially furrowed, with a white margin about 10 mm. wide, conidial areas in dull yellow-green shades near Tea Green or Sage Green, becoming Leaf Green or Andover Green, exudate limitedly, yellow to deep orange-brown in color; odor slight, not distinctive; reverse in pale or dull yellow shades, with surrounding agar pale yellow shades pigmented; penicilli compact irregularly branched with 1, 2, or more branches closely appressed, bearing crowded clusters of metulae and sterigmata (Fig M 36) and loosely parallel conidial chains, up to 60 to 120 μ in length; conidiophores erect, usually straight and appearing more or less rigid, mostly 250 to 600 μ by 3.7 to 5.0 μ , with apices somewhat enlarged up to 4.6 to 6.2 μ , with delicately roughened walled, branches mostly 6.2 to 17.6 μ by 3.1 to 5.6 μ , metulae in groups of 3 to 4, enlarging upward, commonly wedge-shaped, measuring 5.0 to 9.4 μ in length by 3.1 to 4.6 μ in diameter, commonly inflated measuring up to 3.7 to 6.2 μ in diameter; sterigmata in groups of 4 to 6, compact or more or less inflated, usually 7.5 to 10 μ by 2.1 to 3.0 μ , conidia globose to subglobose, variable, ranging from 2.1 to 3.4 μ , with walls smooth or nearly so, and the delicately echinulate or verruculose walls are shown by electron microscopy (Fig E-36)

Colonies on steep agar restrictedly, about 28 mm in 10 to 12 days at 25°C, about 25 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek

Strains of this species isolated from soils

*Dierckx, R. P., Soc. Scienc. Brux 25 89 1901

**Bourge, Ph., Monogr., La Cellule 33 fasc 1 pp 155 157, Col. Pl. II and Pl. III, fig. 16 1923

***Thom C., The Penicillia, pp 235 236 1930

****Raper, K. B., Thom C. and Fennell D. I. Op cit pp 407-411 1949

*****Abe, S., J. Appl. Gen. Microbiology 103 1956

37. *Penicillium stoloniferum* Thom



Fig. M-37A. Low power view of colony section showing typically velvety character of texture.



Fig. M-37B. Low power view of colony section showing loosely parallel or divergent conidial chains



Fig. M-37C. Detail of a single perithecia

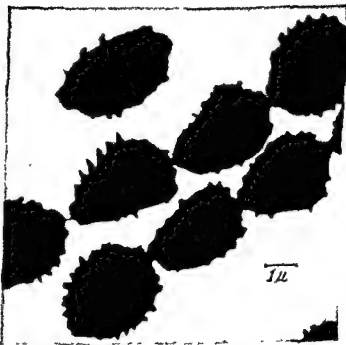


Fig. E-37 *Penicillium stoloniferum* Thum, FAT 815, conidia showing the echinulate or verruculose walls and the elliptical to subglobose form



Fig C-37 *Penicillium stoloniferum* Thom, FAT 815, on Czapek agar, 10 days

ノアヘックル人培養に於ける集落の発育は 25°C にて 5 日 113~39 mm, 10 日 135~54 mm (Fig C-37), 20 日 153~68 mm, 30°C, 10 日 128~48 mm; 37°C 発育不能, 多くの菌株にては中心部が著しく隆起し, 明確な放射状環を有し, 又他の菌株は平滑, 集落周辺部は滑, 又は凸凹あり, 菌叢はロート状, 集落全面に微細構造を作り, 一般に集落周辺部, 中間部に豊富, 分生胞子着生部は黄緑色調, 順次くすんだ黄緑, オリーブ緑, 又は灰緑色調を呈す, 分泌物は欠或は僅小, 薄黄或は褐色調; 集落表面はくすんだ黄色, 又は薄オリーブ色調, 集落周辺部又は無色又は薄黄色調, ヘニラスは恰も短い, 緻密なブランの如く短く且各微細構造が近接緻密に構成 (Fig M-37), 分生胞子は並行状又は少し散開状, 長さ 60~120 μ , 分生胞子柄は基質より直立し, 120~380 $\mu \times 3.0 \sim 5.1 \mu$, 頂端部幾分か膨大 3.9~6.3 μ , 背面又は僅かに斑状粗面, 分枝は 9.5~25 $\mu \times 3.0 \sim 4.7 \mu$, 基枝梗子は緻密に 3~6 μ 群生し, 8.1~22 $\mu \times 2.8 \sim 4.7 \mu$, 頂端部 3.1~6.2 μ , 梗子は 3~8 級高に群生, 比較的に短く, 8.3~12.5 $\mu \times 2.1 \sim 3.3 \mu$, 分生胞子は楕円又は球形, 2.5~4.2 $\mu \times 2.1 \sim 3.4 \mu$, 人刺状又は棒状粗面, 又電子顕微鏡写真 (Fig E-37) にても同様, 粗面

スティープル人培養に於ける集落の発育は 25°C にて 5 日 117~40 mm, 10 日 133~48 mm, 20 日 145~72 mm, 30°C 10 日 123~40 mm, 37°C 発育不能, 他の諸特性は同上

亜硝酸人培養に於ける集落の発育は ノアヘックル人同様良好

本菌株は 1 株 又は腐敗物より屢々分離さる

37. *Penicillium stoloniferum* Thom

Colonies on Czapek agar growing rather rapidly, attaining a diameter of 35 to 54 mm in 10 to 12 days at 25°C (Fig C-37); 28 to 48 mm at 30°C; seldom growing at 37°C; (growing very well on NO_3 medium); strongly wrinkled or radial furrowed in most strains, with central areas often conspicuously raised, and the others smooth, and colonies circumference smooth or rugged, velvety or nearly so; conidial structures abundantly produced throughout the whole colony but generally in greater abundance in marginal to submarginal areas, typically in Yellow-green shades approximately Deep Dull Yellow Green or Empire Green, Leaf Green, Pea Green, becoming similar shades or Velvet Green, Citrine Drab, Deep Olive, evolute lacking or limitedly, pale yellow or brownish shades, odor neither pronounced nor distinctive, reverse dull yellow or pale olive colors, with surrounding agar colorless or pale yellow shades pigmented, penicilli typically short and compact with constituent elements closely appressed, bearing parallel or slightly divergent chains of conidia (Fig M-37) up to 60 to 120 μ in length, and withal presenting the picture of a short, compact brush, conidiophores arising from the substratum, up to 120 to 380 μ by 3.0 to 5.1 μ , with apices somewhat enlarged up to 3.9 to 6.3 μ in diameter, with smooth or slightly punctate walled, branches usually 9.5 to 25 μ by 3.0 to 4.7 μ , metulae compact, ranging from 3 to 6 in number and varying from 8.1 to 22 μ by 2.8 to 4.7 μ , with apices 3.1 to 6.2 μ , sterigmata borne in compact cluster of 3 to 8, comparatively short, generally measuring 8.3 to 12.5 μ by 2.1 to 3.3 μ , conidia elliptical or subglobose, mostly 2.5 to 4.2 μ by 2.1 to 3.4 μ , typically echinulate or verruculose walled, and the echinulate or verruculose walls are shown by electron microscopy (Fig E-37)

Colonies upon steep agar attaining a diameter of 33 to 48 mm in 10 to 12 days at 25°C, 23 to 40 mm at 30°C, seldom growing at 37°C, the other characters similar as on Czapek

Strains of this species isolated from soils and deteriorating materials

*Thom C U S Dept Agr Bur Anim Ind Bull 118, 68 69 fig 26 1910, The Penicillia 292 291 figs 41 and 42 1930

**Raper, J. B., Thom, L. and Fennell D I pp 412 414 1949

***Abe S J Gen Appl Microbiology 103 104 1956

38. *Penicillium ochraceum* Thom



Fig. M-38. *Penicillium ochraceum* Thom, FAT 766, detail of penicilli

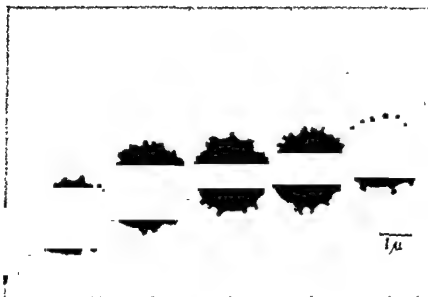


Fig. E-38. *Penicillium ochraceum* Thom, FAT 766, conidia showing the delicately reticulate or echinate walls and the glabrous to subglabrous form

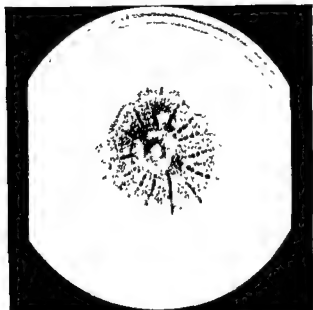


Fig. C-38. *Penicillium ochraceum* Thom, FAT 765, on Czapek agar, 10 days

38 *Penicillium ochraceum* Thom

Colonies on Czapek agar growing rather rapidly, attaining a diameter of about 45 mm. in 10 to 12 days at 25°C (Fig C-38); about 40 mm. at 30°C; seldom growing at 37°C. (growing little or not on NO_2 medium); fasciculate or velutinous, radially becoming definitely zonate, growing margins white to dull buff in color about 25 mm wide, conidial areas yellowish olive shades near Dark Olive, Yellowish Citrine, becoming dark greenish olive near Dark Olive Buff; exudate generally abundantly, colorless or pale pinkish shades, odor pronounced, penetrating, earthy; reverse in dull yellow to vinaceous shades near Vinaceous Fawn, with surrounding agar colorless; conidiophores abundant, arising from submerged or from a well developed aerial felt, 120 to 300 μ by 30 to 43 μ , with apices somewhat enlarged 35 to 45 μ , with walls punctate, penicilli asymmetric and biverticillate, usually showing one or more branches terminating in verticils of metulae and sterigmata (Fig M-38), sometimes showing metulae and sterigmata only, branches and metulae punctate walled, branches variable, 12 to 23 μ by 28 to 38 μ ; metulae loosely compact, 4 to 6 in verticils, mostly 95 to 12 μ by 20 to 27 μ ; sterigmata loosely compact verticils of 4 to 6, mostly 76 to 96 μ by 18 to 26 μ ; conidia globose to subglobose, mostly 25 to 38 μ , with slightly spinulose walled, and the delicately verruculose or echinulate walls are shown by electron microscopy (Fig E-33); conidial chains tangled or loosely parallel, up to 30 to 120 μ in length

Colonies on steep agar about 43 mm in 10 to 12 days at 25°C; about 40 mm at 30°C, seldom growing at 37°C; generally deeper than on Czapek, sporulating more abundantly but with color and general colony pattern as above, the other characters as on Czapek

Strains of this species isolated from soils or organic materials undergoing slow decay

*Thom, C. The Penicillia, pp 309 310 1939

**Raper, K. B. Thom, C. and Fenrell, D. I., A Manual of the Penicillia, pp 477 479 1949

***Abe, S. J. Gen Appl Microbiology p 105 1956.

ソッペック寒天培基に於ける集落の発育は 25°C にて 5 日目約 15 mm, 10 日目約 45 mm (Fig C-38), 20 日目約 70 mm; 30°C 10 日目約 40 mm; 37°C 発育不能, 菌叢束状又はブロード状様, 放射状の菌を有し, 順次輪生状に発育, 集落円周部は白色又は少し黄色, 約 25 mm 幅; 分生胞子着生部は黄オリーブ色調, 順次暗緑オリーブ色調を呈す; 産出物豊富, 無色又は薄桃色調; 集落裏面はくすんだ黄色又は薄桃紫色調, 集落周辺欠片は無色; 分生胞子柄は豊富で, 基底菌糸又は気菌糸より生育, 120~300 μ ×30~43 μ , 頂端部幾分か膨大, 35~45 μ , 筒状粗面; ヘニラスは不整斉輪生状, 常に基底梗了, 梗了の群生を持った分枝は一段又は数段に分枝を示す (Fig M-38), 又時に基底梗了, と梗了のみの場合もあり; 分枝は変化に富み, 12~23 μ ×28~38 μ 粗面, 基底梗了, 緻密状様に 4~6 ケ群生, 95~12 μ ×20~27 μ , 粗面, 梗了は緻密状様に 4~6 ケ群生, 76~96 μ ×18~26 μ ; 分生胞子球状又は並珠形, 25~38 μ , 仄かに小刺状粗面, 又電子顕微鏡写真 (Fig E-38) にても幾分か瘤状又は刺状粗面; 分生胞子連鎖は鏈状又は並行状様, 長さ 30~120 μ

スティープル寒天培基に於ける集落の発育は 25°C にて 5 日目約 14 mm 10 日目約 43 mm, 20 日目約 67 mm, 30°C 10 日目約 40 mm, 37°C 発育不能, 分生胞子の着生豊富, 他の諸性質は同上。

亜硝酸寒天培基にては特長的に生育不能

本菌種は土壌又は腐物を行いつつある, 有機物, より分離さる。

39. *Penicillium crustosum* Thom



Fig. M-39A. *Penicillium crustosum* Thom, FAT 703, low power view of colony section showing typically fasciculate of texture

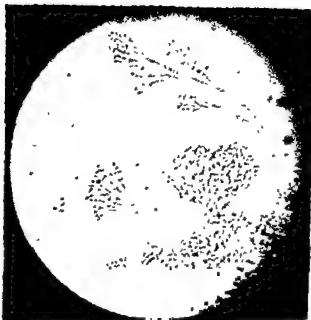


Fig. M-39B. *Penicillium crustosum* Thom, FAT 735, details of penicilli

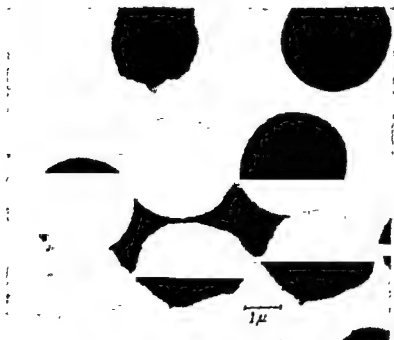


Fig. F-39. *Penicillium crustosum* Thom, FAT 735, conidia showing the smooth or nearly smooth walls and the glabrous to subglabrous form.

40. *Penicillium viridicatum* Westling

40. *Penicillium viridicatum* Westling



Fig. M-40 A. *Penicillium viridicatum* Westling, FAT 818, low power view of colony section showing typical fasciculate character of texture.

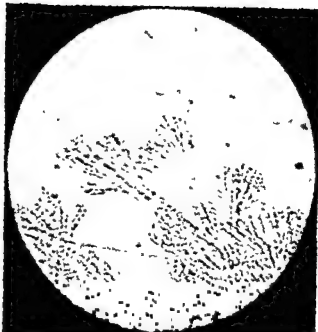


Fig. M-40 B. *Penicillium viridicatum* Westling, FAT 818, detail, of penicilli



Fig. E-40. *Penicillium viridicatum* Westling, FAT 818, conidia showing the slightly rough walls and the glabrous orate form

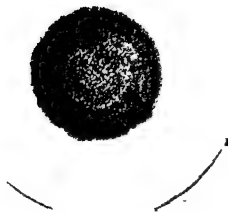


Fig C-40. *Penicillium viridicatum* Westling, FAT 818, on Czapek agar, 10 days

ノベック欠天培養に於ける生落の発育は 25°C にて 5 日 11 17~19 mm, 10 日 52~68 mm (Fig C-40), 20 日 64~68 mm, 30°C 10 日 18~41 mm, 37°C 発育不能; 菌叢束状, 平滑又は放射状を有し, 分生胞子着生は全面的又は成る菌体にては生落周囲附近, 中間部に多い, 生落周囲部は白色, 0.3~1.5 mm 幅, 分生胞子着生部は特長的に鮮明黄緑色調 (約 4 週間保つ), 順次くすんだ黄緑色調を呈す; 分泌物は僅小又は豊富, 黄色又は黄褐色, 生落表面は黄, 橙, 又は橙褐色調, 生落周辺欠天は鈍, 薄褐, 黄色調に広く着色; ペニラスは不整斉輪状, 比較的大型 (Fig M-40), 分生胞子柄は 190~450 μ \times 37~50 μ , 頂端部 4.0~5.6 μ , 顆粒状粗面; ヘニラスは屢々不規則で, 分枝, 基底梗子, は異った段階位置に一貫しては作らない, 常に 1~3 ケ群の分枝は 12~37 μ \times 2.5~4.5 μ , 一段又は二段又は 1:1 に分枝す, 基底梗子は棍棒状様に 2~5 ケ群生, 8.7~17 μ , 顆粒状粗面, 梗子は棍棒状様に 3~6 ケ群生, 8.1~12.5 μ \times 1.8~3.7 μ , 分生胞子球形 卵形又は亜球形, 2.1~3.1 又は 4.1 μ , 滑面, 又電子顕微鏡写真 (Fig E-40) には 0.1 μ 以下の僅小な粗面, 分生胞子連鎖は縦又は並行状, 長さ 30~160~250 μ

スティープル人培養に於ける生落の発育は 25°C にて 5 日 11 18~20 mm, 10 日 35~53 mm 20 日 65~72 mm, 30°C 10 日 23~41 mm, 37°C 発育不能, 不明確な又は僅小な放射状を有し, 他の諸特性は同じ

希培養人培養に於ては特長的に発育不能 本菌株は 1 環, 又はチーズ, 及腐敗試料より分離さる

40 *Penicillium viridicatum* Westling

Colonies on Czapek agar growing rather rapidly, attaining a diameter of 52 to 68 mm in 10 to 12 days at 25°C; (Fig C-40), 18 to 41 mm at 30°C, seldom growing at 37°C; (growing little or not on NO_2 -medium), fasciculate, smooth or radial furrows, heavily sporing throughout in some strains, less heavily sporing in others with conidial development heaviest in marginal to sub-marginal zones, with a white margin 0.3 to 1.5 mm wide; conidial areas when young characteristically in bright yellow green shades near Spinach Green, Cedare Green, usually remaining persistently green (during about 4 weeks), becoming similar shades of Cedar Green, Parrot Green, exudate limedly or abundantly, colorless or pale yellow color, odor strong, moldy, and in some strains sourish, reverse yellow, orange or orange-brown shades, with surrounding agar pinkish, light brown or yellow shades broadly pigmented; penicilli asymmetrical and biverticillate, comparatively large (Fig M-40), conidiophores commonly 190 to 450 μ by 37 to 50 μ , with apices somewhat enlarged up to 40 to 56 μ with granular walled, penicilli often irregular, with branches, metulae and sterigmata not consistently produced at different levels, usually showing 1 to 3 branches 12 to 37 μ by 2.5 to 4.5 μ , occasionally showing secondary branches, with each branch or subbranch 2 to 5 metulae, loosely compact, mostly 8.7 to 17 μ by 2.2 to 3.8 μ , with walls typically granular, sterigmata commonly in clusters of 3 to 6, loosely compact, measuring 8.1 to 12.5 μ by 1.8 to 3.7 μ , usually borne at approximately the same level in some strains, not in others, conidia globose or ovate, subglobose, usually 2.1 to 3.1 μ or 4.1 μ , with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-40), and conidial chains tangled or parallel, up to 30 to 160 μ or 250 μ in length.

Colonies on steep agar growing rather slowly or rapidly spreading, 35 to 53 mm in 10 to 12 days at 25°C; 23 to 41 mm at 30°C, seldom growing at 37°C, loosely or slightly radial furrowed, the other characters as on Czapek

Strains of this species isolated from the soils and deteriorating materials and infected cheeses

*Westling, R. Arkiv för Botanik 11 53, 89 90, figs 14 and 56 1911

**Thom, C. The Penicillia, p 394 1930

***Raper, K. B., Thom, C. and Fennell, D. I. A Manual of the Penicillia, pp 452 457 1949

****Abe, S. J. Gen Appl Microbiology pp 106 107 1956



Fig. M-40 A. *Penicillium viridicatum* Westling, FAT 818, low power view of colony section showing typical fasciculate character of texture.

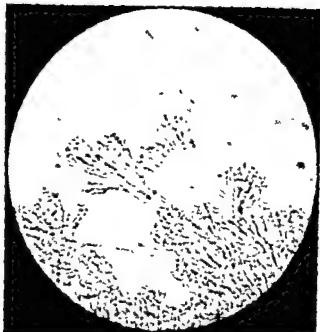


Fig. M-40 B. *Penicillium viridicatum* Westling, FAT 818, detail, of penicilli



Fig. L-40. *Penicillium viridicatum* Westling, FAT 818, conidia showing the slightly rough walls and the glabrous or ovate form



Fig C-40 *Penicillium viridicatum* Westling, FAT 818, on Czapek agar, 10 days

ソベック寒天培養に於ける集落の発育は 25°C にて 5 日目 17~19 mm, 10 日目 52~68 mm (Fig C-40), 20 日目 64~68 mm, 30°C 10 日目 18~41 mm, 37°C 発育不能, 菌糸束状, 平滑又は放射状叢を有し, 分生胞子着生は全面的又は束の菌糸にては集落内周部附近, 中間部の方に多い, 集落内周部は白色, 0.3~1.5 mm 幅, 分生胞子着生部は特長に輝明黄緑色調 (約 4 週間経つ), 順次くすんだ黄緑色調を呈す, 産出物は僅小又は豊富, 無色又は蒼黄色; 集落表面は黄, 橙, 又は橙褐色調, 集落周辺は黄, 薄黄, 黄色調に広く蒼色; ヘニラスは不整腎輪生状, 比較的大型 (Fig M-40), 分生胞子柄は 190~450 μ \times 37~50 μ , 頂端部 40~56 μ , 顆粒状粗面, ヘニラスは種々不規則で, 分枝, 基底梗子, は異った段階位置に一貫しては作らない, 常に 1~3 ケ群れの分枝は 12~37 μ \times 25~45 μ , 一段又は二段又は以上に分枝す, 基底梗子は松密状態に 2~5 ケ群れ, 87~17 μ , 顆粒状粗面, 梗子は松密状態に 3~6 ケ着生, 81~125 μ \times 18~37 μ , 分生胞子球形 卵形又は垂珠形, 21~31 又は 41 μ , 滑面, 又電子顕微鏡写真 (Fig E-40) には 0.1 μ 以下の小さな粗面, 分生胞子連鎖は粒状又は串行状, 長さ 30~160~250 μ

ステープル入培養に於ける集落の発育は 25°C にて 5 日目 18~20 mm, 10 日目 35~53 mm, 20 日目 65~72 mm, 30°C 10 日目 23~41 mm, 37°C 発育不能, 1 明確な又は小さな放射状叢を有し, 他の諸特性は同じ

亜硝酸入培養に於ては特長に発育不能 本菌株は 1 塊, 又はチーズ, 及腐敗試料より分離さる,

40. *Penicillium viridicatum* Westling

Colonies on Czapek agar growing rather rapidly, attaining a diameter of 52 to 68 mm in 10 to 12 days at 25°C, (Fig C-40); 18 to 41 mm at 30°C; seldom growing at 37°C; (growing little or not on NO₂-medium), fasciculate, smooth or radial furrows, heavily sporing throughout in some strains, less heavily sporing in others with conidial development heaviest in marginal to sub-marginal zones, with a white margin 0.3 to 1.5 mm wide, conidial areas when young characteristically in bright yellow green shades near Spinach Green, Cedare Green, usually remaining persistently green (during about 4 weeks), becoming similar shades of Cedar Green, Parrot Green; exudate limitedly or abundantly, colorless or pale yellow color, odor strong, moldy, and in some strains sourish, reverse yellow, orange or orange-brown shades, with surrounding agar pinkish, light brown or yellow shades broadly pigmented, penicilli asymmetrical and biverticillate, comparatively large (Fig M-40); conidiophores commonly 190 to 450 μ by 37 to 50 μ , with apices somewhat enlarged up to 40 to 56 μ with granular walled; penicilli often irregular, with branches, metulae and sterigmata not consistently produced at different levels, usually showing 1 to 3 branches 12 to 37 μ by 25 to 45 μ , occasionally showing secondary branches, with each branch or sub-branch 2 to 5 metulae, loosely compact, mostly 87 to 17 μ by 22 to 38 μ , with walls typically granular, sterigmata commonly in clusters of 3 to 6, loosely compact, measuring 81 to 125 μ by 18 to 37 μ , usually borne at approximately the same level in some strains, not in others; conidia globose or ovate, subglobose, usually 21 to 31 μ or 41 μ , with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-40), and conidial chains tangled or parallel, up to 30 to 160 μ or 250 μ in length

Colonies on steep agar growing rather slowly or rapidly spreading, 35 to 53 mm in 10 to 12 days at 25°C, 23 to 41 mm at 30°C, seldom growing at 37°C, loosely or slightly radial furrowed, the other characters as on Czapek

Strains of this species isolated from the soils and deteriorating materials and infected cheeses

*Westling, R. Arkiv för Botanik 11: 53, 89, 90, figs 14 and 56, 1911

**Thom, C. The Penicillia p. 394, 1930

***Raper, A. B., Thom, C. and Fennell, D. I. A Manual of the Penicillia, pp. 482, 487, 1949

****Abe, S., J. Gen. Appl. Microbiology pp. 106-107, 1956

41. *Penicillium viridi-cyclopium* Abe

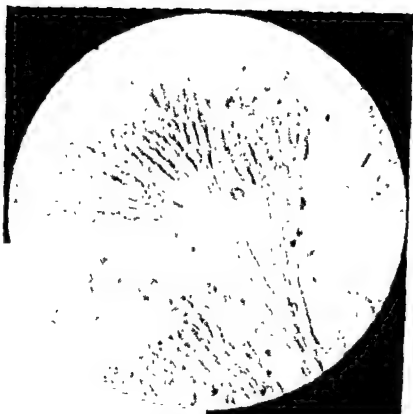


Fig. M-41. *Penicillium viridicytopium* Abe, FAT 1046, detail of penicilli

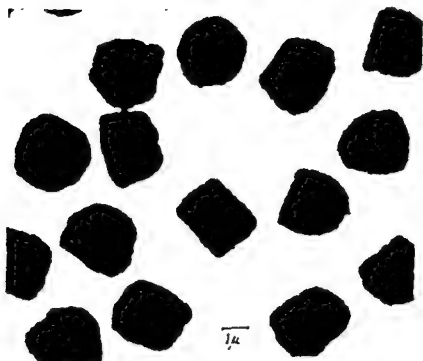


Fig. L-41. *Penicillium viridicytopium* Abe, FAT 1046, conidia showing the slightly

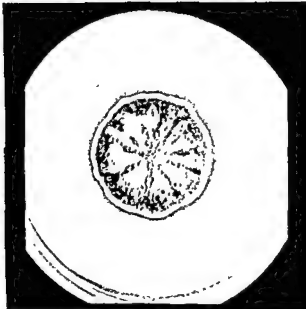


Fig. C-41. *Penicillium viridi-cyclopium* Abe, FAT 1044, on Czapek agar, 10 days.

41 *Penicillium viridi-cyclopium* Abe

Colonies on Czapek agar growing rather rapidly, attaining a diameter of 30 to 47 mm in 10 to 12 days at 25°C (Fig. C-41), 17 to 33 mm at 30°C, seldom growing at 37°C, (growing little or not on NO_2 medium), surface smooth or loosely furrowed, with a white margin 0.8 to 1.5 mm wide, typically slightly fasciculate, abundantly sporulating throughout in most strains; conidial areas in typical yellow green or bluish yellow green colors in some strains typical blue green near Deep Dull Yellow Green, American Green, Empire Green, Dark Zinc Green, Dark Russian Green, becoming simi ar or darker shades slate olive, grayish olive shades, with surrounding agar usually quickly developing cinnamon or pinkish cinnamon shades, becoming orange cinnamon or brownish shades broadly pigmented, exudate limited, colorless or pale yellow, odor abundant, moldy; conidiophores primarily arising from the substratum, commonly up to 120 to 380 or 440 μ in length by 37 to 56 μ in diameter, apices 40 to 58 μ in diameter, with typical granular walls; penicilli biverticillate and asymmetrical, commonly showing one or more branches in addition to the main

ノアヘック寒天培養に於ける集落の発育は 25°C にて 5 日目 15~28 mm, 10 日目 30~47 mm, (Fig. C-41) 20 日目 46~65 mm, 30°C 10 日目 17~33 mm, 37°C 発育不能。集落は平滑又は皺があり、集落周囲部は白色、0.8~1.5 mm 幅、菌叢束状、多くの菌糸には分生胞子着生は豊富、分生胞子着生部は黄緑色或は青味を帯びた黄緑色、順次同色調の濃黄色又は褐オリーブ色又は灰オリーブ色調を呈す。集落周辺寒天は常に薄褐色或は浅褐色調、順次橙褐色或は褐色調に転化し、滲出物は僅小、無色又は薄黄色調; 分生胞子柄は基質より直立し、一般に 120~380~440 μ × 37~56 μ , 頂端部 40~58 μ , 顆粒状粗面; ヘニラスは不整斉輪生状、一段又はそれ以上の分枝を示し、各々抱子を持った基底梗子が 2~5 ケ群生している (Fig. M-41)、分枝は変化に富み、9.3~31 μ × 37 μ × 30~49 μ , 顆粒状粗面、基底梗子は 7.5~15.6 μ × 2.5~4.5 μ , 滑面、抱子輪生状に、又類圓形に 3~7 ケ着生、8.1~12.5 μ × 2.1~3.1 μ , 分生胞子は球形又は卵球形、2.1~3.8 μ , 滑面、又電子顕微鏡写真 (Fig. E-41) には 0.1 μ 以下の小さな粗面、分生胞子連鎖は平行状又は斜行状、長さ 50~220~260 μ

スティーブス寒天培養に於ける集落の発育は 25°C にて 5 日目 18~28 mm, 10 日目 29~47 mm, 20 日目 54~70 mm; 30°C 10 日目 16~33 mm, 37°C 発育不能; 集落表面は常に放射状の皺があり、他の諸特性は同上。

亜硝酸寒天培養に於ける集落の発育は 25°C にて 5 日目 18~28 mm, 10 日目 29~47 mm, 20 日目 54~70 mm; 30°C 10 日目 16~33 mm, 37°C 発育不能; 集落表面は常に放射状の皺があり、他の諸特性は同上。

walls or nearly so, sterigmata in fairly compact or loosely compact verticils of 3 to 7, mostly 8.1 to 12.5 μ by 2.1 to 3.1 μ , acute type; conidia globose to subglobose, mostly 2.5 to 3.8 μ , smooth or nearly so walled and the slightly rough walls are shown by electron microscopy (Fig. I-41), conidial chains loosely parallel or tangled up to 50 to 220 or 260 μ in length

Colonies on steep agar rather rapidly, 29 to 47 mm in 10 to 12 days at 25°C, 16 to 30 mm at 30°C, seldom growing at 37°C, surface usually radially furrowed the other characters are as described above

Strains of this species isolated from the soils and deteriorating materials.

*Abe - Gen. Appl. Microbiology 1971 10: 104

42. *Penicillium palitans* Westling

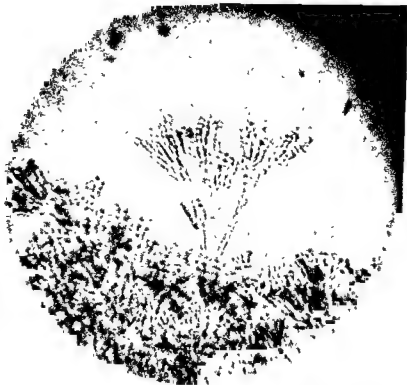


Fig. C-42. *Penicillium palitans* Westling, FAT 835, detail of penicilli

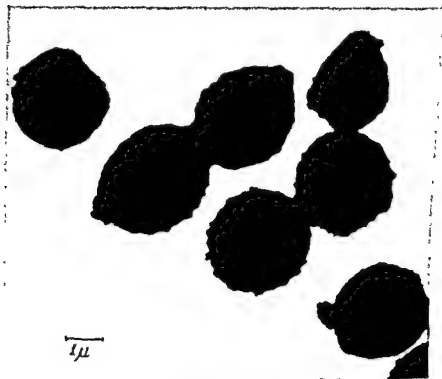


Fig. E-42. *Penicillium palitans* Westling, FAT 835, conidia showing the slightly rough walls and the glabrous to subglabrous form



Fig. C-42. *Penicillium politans* Westling, FAT 838, on Czapek agar, 10 days

ノアへ、クブ入培養に於ける集落の発育は 25°C にて 5 日 22~23 mm, 10 日 42~50 mm (Fig. E-42), 20 日 58~62 mm; 30°C 10 日 28~33 mm; 37°C 発育不能; 集落の高さは中間部乃至円周部にては 200~700 μ , 中心部は 800~900 μ 集落表面は顆粒状又は粉状を呈し、顕著な水状菌落ではなく、幾分か束状、平滑、又は浅い乃至顕著な放射状皺を有し、集落円周部は白色、約 0.8 mm 幅; 多くの菌絲は分生胞子の着生部は、分生胞子着生部は暗黄緑色、産出部は小さく、無色; 集落表面は無色又は暗黄色、集落周辺部は無色、ヘンシラスは不整環状、比較的大型で分生胞子柄上に 1~2 段の分枝を有す (Fig. M-42); 分生胞子は 120~380 $\mu \times 41 \sim 59 \mu$, 頂端部 43~63 μ , 顆粒状粗面、分枝は 125~33 $\mu \times 37 \sim 53 \mu$, 基端部は 3~5 μ 短柄部に 1 群、93~187 $\mu \times 28 \sim 47 \mu$, 短柄部は 3~6 μ 柄部、93~125 $\mu \times 25 \sim 36 \mu$, 分生胞子球形又は亜球形、28~42 μ 直径、又電子顕微鏡写真 (Fig. E-42) には 0.1 μ 以下の微小粗面、分生胞子産出部は短柄又は長柄、長さ 120~380 μ .

マレーブと大培養に於ける集落の発育は 25°C にて 5 日 21~28 mm, 10 日 42~62 mm, 20 日 66~70 mm, 30°C 10 日 28~32 mm, 37°C 発育不能、他の諸特性は同上

本菌株は土壌、ハルブ粉、茎、等より分離さる

42. *Penicillium politans* Westling

Colonies on Czapek agar rather rapidly, a diameter of 42 to 50 mm in 10 to 12 days at 25°C

to submarginal areas up to 800 to 900 μ in colony center, surface appearing granular or mealy but generally not conspicuously fasciculate, slightly fasciculate, with smooth or shallow to prominent radial furrows, growing margin white, about 0.8 mm. wide, heavily sporing throughout in most strains, conidial areas in darker yellow green shades near Andover Green or Vetiver Green, exudate limitedly, colorless, not in others, odor pronounced, moldy; reverse colorless or pale yellow colors, with surrounding agar colorless; penicilli asymmetric and biverticillate, comparatively large, generally showing 1 or 2 branches in addition to the main axis, (Fig. M-42); conidiophores mostly 120 to 380 μ by 41 to 59 μ with apices somewhat enlarged up to 43 to 63 μ in diameter, with granular walled, branches commonly ranging from 125 to 33 μ by 3.7 to 5.3 μ , metulae in groups of 3 to 5, mostly 93 to 187 μ by 28 to 47 μ , loosely compact; sterigmata usually borne in loosely compact verticils of 3 to 6 measuring 93 to 125 μ by 2.5 to 3.6 μ , conidia globose to subglobose, mostly 28 to 42 μ , with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig. F-42), conidial chains tangled or loosely parallel, up to 120 to 380 μ in length

Colonies on steep agar growing more rapidly, 42 to 62 mm in 10 to 12 days at 25°C; 28 to 32 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek

Strains of this species isolated from soils and pulp-mill and pears and the others

*Westling R. Arkiv for Botanik 11 53 83 86 figs 12 and 54 1911

**Thom C. The Penicillia, pp 396 397 1930

***Kaper, K. B. Thom C and Fennell D I A Manual of the Penicillia pp 438 439 1919

****Abe S. J Gen Appl Microbiology 109 1956

43. *Penicillium cyclopium* Westling



Fig. M-43 A. *Penicillium cyclopium* Westling, FAT 1052, low power view of colony section showing fasciculate character of texture



Fig. M-43 B. *Penicillium cyclopium* Westling, FAT 1052, detail of a single penicillus

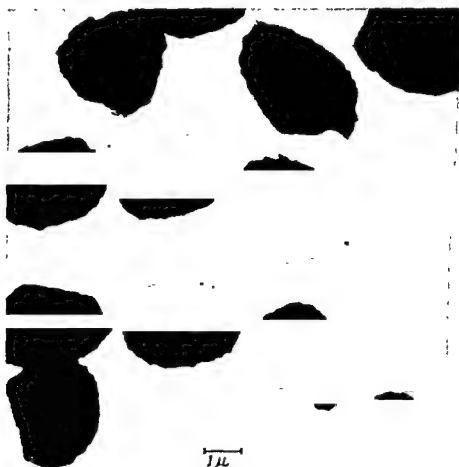


Fig. I-67. *Penicillium cyclopium* Westling, FAT 1052 conidia showing the slightly rough walls and the elliptical or ovate to subglobose form

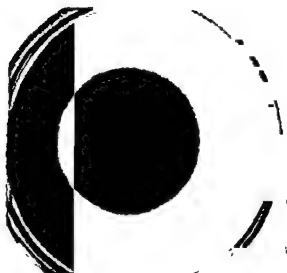


Fig C-43 *Penicillium cyclopium* Westling, FAT 642, on Czapek agar, 10 days

43. *Penicillium cyclopium* westling

Colonies on Czapek agar growing rapidly, attaining a diameter of 43 to 60 mm in 10 to 12 days at 25°C, 21 to 48 mm at 30°C, seldom growing at 37°C; (growing little or not on NO₂-medium), smooth or loosely radially furrowed, azonate or broadly zonate in age, surface appearing granular or mealy, fasciculate, with margin compact, white, about 1.0 to 1.2 mm wide, heavily sporing throughout and shading quickly through blue green shades near Dark Russian Green or Bluish Gray Green, becoming similar shades or Dark Porcelain Green, Artemisia Green; exudate lacking or limitedly, colorless; odor pronounced, moldy, reverse colorless or light drab, smoke gray shades, with surrounding agar colorless, penicilli large, asymmetric and biverticillate, usually showing one or more branches with metulae and sterigmata commonly borne at different levels (Fig M-43), conidiophores arising from the substratum, mostly 120 to 380 μ by 34 to 56 μ with apices somewhat enlarged up to 37 to 59 μ , with granular walled, branches variable, 93 to 31 μ by 28 to 47 μ with granular walled; metulae loosely compact verticils of 2 to 6, mostly 87 to 137 μ by 28 to 40 μ , with apices 31 to 46 μ , sterigmata usually borne in loosely compact verticils of 4 to 7, 87 to 125 μ by 21 to 34 μ , conidia elliptical or ovate to subglobose, mostly 28 to 41 μ by 21 to 32 μ with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-43), conidial chains loosely column or parallel, up to 60 to 250 μ in length.

Colonies on steep agar growing about 48 to 68 mm in 10 to 12 days at 25°C, 25 to 55 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek

Strains of this species isolated from soils and deteriorating materials

*Westling, R. Arkiv för Botanik 11, 55 56, 90 92, figs 15, 57 1911

**Thom L., The Penicillia pp 394 395 1939

***Raper, K. B. Thom, C. and Fennell D. I. A Manual of the Penicillia, pp 493 497

****Abe S., J. Gen. Appl. Microbiology 110 1956

ソッヘック天培安に於ける生落の発育は 25°C にて 5 日 21~32 mm, 10 日 43~60 mm; (Fig C-43) 20 日 57~66 mm, 30°C 10 日 21~48 mm, 37°C 発育不能, 生落平滑又は放射状模様を有し, 時に輪紋状に発育, 表面は顆粒状又は粉状で, 菌叢束状; 生落円周部は白色, 緻密, 約 1.0~1.2 mm 幅, 分生胞子着生全面的; 分生胞子着生部は青緑色調, 順次黄緑又はくすんだ青緑色調を呈す; 渗出物は欠又は僅小, 無色; 生落裏面は無色又は薄灰褐色, 灰色調, 生落周辺部又は無色; ヘニラスは大きく, 不整斉輪生状, 常に一乃至以上の分枝を有す (Fig M-43); 分生胞子柄は基質より直立, 120~380 μ \times 34~56 μ , 頂端部は膨大 37~59 μ , 顆粒状粗面, 分枝は変化に富み, 93~31 μ \times 28~47 μ , 顆粒状粗面, 基底部は 2~6 μ 着生, 87~137 μ \times 28~40 μ , 頂端部 31~46 μ , 柄子は緻密状に 4~7 μ 群生, 87~125 μ \times 21~34 μ ; 分生胞子は球形 卵形又は短球形, 28~41 μ \times 21~32 μ , 滑面, 電子顕微鏡写真 (Fig E-43) には 0.1 μ 以下の微小粗面, 分生胞子産殖は円柱状様又は並行状, 長さ 60~250 μ

スティープ天培安に於ける生落の発育は 25°C にて 5 日 25~35 mm, 10 日 48~68 mm, 20 日 65~74 mm; 30°C 10 日 25~55 mm, 37°C 発育不能; 他の諸特性は同上

事情異なる培安にては特長的に発育不能

本菌種は土壌及び其の他の試料より分離する

44. *Penicillium aurantio-virens* Biourge



Fig. C-44 A. *Penicillium aurantio-erythrae* Bourge, FAT 118, low power view of colony section showing typically fasciculate character of texture.

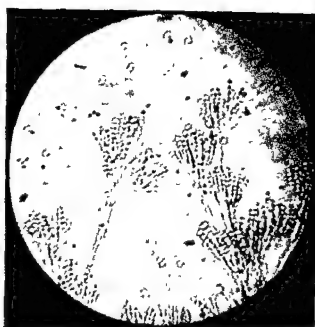


Fig. M-44 B. *Penicillium aurantio-erythrae* Bourge, FAT 1226, detail of penicilli



Fig. U-44. *Penicillium aurantio-erythrae* Bourge, FAT 1226, conidia showing the slightly rough walls and the elliptical or ovate form



Fig. C-41. *Penicillium aurantio-virens* Biourge, FAT 1226, on Czapek agar, 10 days

ノアヘック底天培養に於ける集落の発育は 25°C にて 5 日 11 21~28 mm, 10 日 11 43~48 mm (Fig C-44), 20 日 11 55~70 mm; 30°C, 10 日 11 12~40 mm, 37°C 発育不能; 菌糸は束状, 集落平滑又は放射状隆起を有し, 集落周囲部は白色, 約 10~15 mm 幅, 分枝胞子菌生部は青緑色, 青灰緑色, 黄青緑色調, 類灰褐色調又は暗緑オリーブ緑色調を呈し, 或る菌株にては暗黄緑色調, 産出物微小又は豊富, 無色又は黄黄色調; 集落表面くすんだ黄色, 類灰褐色調, 集落周辺部無色類灰黄褐色調を呈す; ヘニソラスは小葉片輪生状, (Fig M-44), 買ったレベルに梗す, 基底梗すをもった小規則的な分枝を有している, 分枝胞子柄は革質又は気筒より円形, 120~380 μ \times 37~62 μ , 頂端部 46~68 μ , 頸状状粗面, 分枝はサイズ変化に富み, 93~29 μ \times 31~50 μ , 頸状状粗面, 基底梗す部に縦糸状に 2~5 ケ群生, 81~156 μ \times 25~44 μ , 頂端部 31~50 μ ; 梗す 3~5 微糸状に富み, 93~125 μ \times 23~36 μ , 分枝胞子柄門又は卵形 31~47 μ \times 26~40 μ , 滑面, 又電子顕微鏡写真 (Fig E-44) にては 0.1 μ 以下の微小な粗面, 分枝胞子連鎖は粒状様又は串行状, 長さ 60~190 μ

ステープル底天培養に於ける集落の発育は 25°C にて 5 日 11 16~37 mm, 10 日 11 33~58 mm, 20 日 11 57~72 mm, 30°C 10 日 11 13~40 mm, 37°C 発育不能, 他の諸特性は同じ

亜硝酸酸入り培養にては特異的に発育不能 本菌株は土壤及び腐敗植物より分離さる。

41. *Penicillium aurantio-virens* Biourge

Colonies on Czapek agar growing somewhat rapidly, attaining a diameter of 43 to 48 mm. in 10 to 12 days at 25°C (Fig C-44); 12 to 40 mm. at 30°C, seldom growing at 37°C; (growing little or not on NO₂ medium), fasciculate, smooth or loosely radial furrowed, with white margin about 10 to 15 mm wide, conidial areas blue green shades near Bluish Gray Green, Dark Zinc Green, Dark Russian Green, becoming similar shades or Dusky Olive Green, some strains dark yellow green shades, exudate limited or abundant, colorless or pale yellow shades; odor strong, moldy; reverse in dull yellow color becoming brownish shades, with surrounding agar colorless becoming dull yellow shades pigmented, penicilli asymmetric and biverticillate (Fig M-44), irregularly branched with metulae and sterigmata commonly borne at different levels; conidiophores arising from the substratum or as branches from aerial hyphae, commonly 120 to 380 μ by 37 to 62 μ , with apices somewhat enlarged up to 40 to 68 μ , with apices granular walled, branches variable in size, commonly 93 to 29 μ by 31 to 50 μ with granular walled, metulae usually in clusters of 2 to 5, loosely compact, commonly 81 to 156 μ by 25 to 44 μ , with apices 31 to 50 μ ; sterigmata loosely compact verticils of 3 to 5, commonly 93 to 125 μ by 23 to 36 μ ; conidia elliptical or ovate, mostly 31 to 47 μ by 26 to 40 μ , with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-44), conidial chains loosely tangled or parallel, up to 60 to 190 μ in length

Colonies on steep agar growing about 38 to 58 mm in 10 to 12 days at 25°C, 13 to 40 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek.

Strains of this species isolated from soils and spoiled starch paste.

*Biourge, Ph., Monograph, La Cellule 33 fasc 1 pp 119 121 1923

**Thom, C The Penicillia pp 316 317 1913

***Raper K B Thom, C and Fennell, D I A Manual of the Penicillia pp 503 505

****Abe S, J Gen Appl Microbiology pp 110 111 1976

45. *Penicillium palitans* Westling var. *echinoconidium* Abe



Fig. M-45. *Penicillium palitans* Westling var. *echinoconidium* Abe, FAT 819, detail of the single penicillus.



Fig. I-45. *Penicillium palitans* Westling var. *echinoconidium* Abe, FAT 819, conidia showing the conspicuously echinate or verruculose walls and the glaucous form.

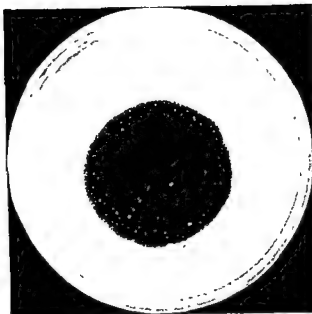


Fig. C-45. *Penicillium politans* Westling var. *echinoconidium* Abe, FAT 848, 10 days.

ソヘック寒天培養に於ける生落の発育は 25°C に 5 日目 24~26 mm, 10 日目 50~53 mm (Fig. C-45); 20 日目 62~65 mm, 30°C 10 日目 27~28 mm; 37°C 発育不能, 生落は放射状の皺を有し, 表面は顆粒状乃至明瞭な房状をなし, 菌叢束状, 分生胞子は全面に密生。生落周囲部は白色, 約 1.5 mm 幅; 分生胞子着生部は暗黄緑色調暗黄緑ナリーブ緑色調を呈す, 突出物は僅小, 無色; 生落裏面は無色又は薄黄色, 順次薄褐色調, 生落周辺未生は無色, 順次薄黄色調無色, 分生胞子柄は基質より直立し, 120~320 μ /43~50 μ , 頂端部 4.3~6.3 μ , 顆粒状粗面, ヘニラス不整所輪状で 1~2 ケの各分枝を有し, 同一ヘニラス上にも屢々不均一 (Fig. M-45), 分枝は 11.2~24 μ \times 3.4~5.0 μ , 基底胞子は 3~5 ケ散点状群に群生, 9.3~13.7 μ 又は 18.7 μ \times 2.8~4.7, 梗は 4~8 ケ縦密状群に密生, 10~11.9 μ \times 2.5~3.1 μ ; 分生胞子, 球形又は亜球形, 3.1~4.3 μ 若し人刺状又は短状粗面, 又電子顕微鏡写真 (Fig. E-45) にても同一様粗面, 分生胞子連鎖は変化に富み, 鏈状, 並行状様又は散開状様, 1~3 μ 60~120 μ 。

ステーフス寒天培養に於ける生落の発育は 25°C にて 5 日目 28~30, 10 日目 51~55 mm, 20 日目 70~72 mm, 30°C 10 日目 28~30 mm, 37°C 発育不能, 他の諸特性は上記同一様, 亜硝酸寒天培養にては特異的に発育不能。

本菌株は土壌又は腐敗材料より分離さる

45. *Penicillium politans* Westling var. *echinoconidium* Abe.

Colonies on Czapek agar rather rapidly spreading a diameter of 50 to 53 mm in 10 to 12 days at 25°C (Fig. C-45); 27 to 28 mm. at 30°C; seldom growing at 37°C, (growing little or not on NO_3 medium), usually radially furrowed, and with surface appearing granular to definitely tufted, typically fasciculate, heavily sporulating throughout, with a white margin about 15 mm wide; conidial areas in dark yellow green shades, near Dusky Yellow Green, becoming dark olive near Dusky Olive Green with age, exudate limited, colorless, odor, definitely moldy, reverse colorless or pale yellow, becoming pale brown, with surrounding agar usually colorless, becoming tardily pale yellow, conidiophores usually arising directly from the substratum, commonly up to 120 to 320

appeared and often unequal in the same penicillus (Fig. M-45) commonly ranging from 11.2 to 24.0 μ by 3.4 to 5.0 μ ; bearing metulae in groups of 3 to 5 loosely compact, mostly 9.3 to 13.7 μ or occasionally 18.7 μ by 2.8 to 4.7 μ , sterigmata usually borne in loosely compact verticils of 4 to 8, mostly 10.0 to 11.9 μ by 2.5 to 3.1 μ , acute type, conidia globose to subglobose, mostly 3.1 to 4.3 μ , with walls conspicuously echinulate or verruculose, conidial chains variable, tangled, loosely parallel or divergent, up to 60 to 120 μ in length, conidia walls typically conspicuously echinulate or verruculose as shown in electron microscopy (Fig. E-45).

Colonies on steep agar rather rapidly, 51 to 55 mm in 10 to 12 days at 25°C, 28 to 30 mm at 30°C, seldom growing at 37°C, the other characters as are described above.

Strains of this species isolated from soils and aging materials.

46. *Penicillium cyclopium* Westling var. *echinulatum* Raper and Fennell



Fig. M-16. *Penicillium cyclopium* Westling var. *echinulatum* Raper and Fennell, FAT 987, detail of penicilli.

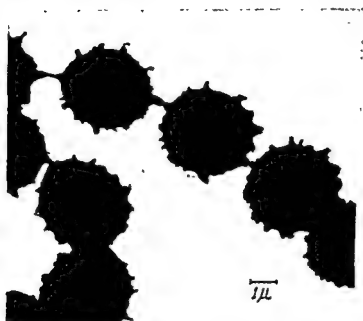


Fig. E-16. *Penicillium cyclopium* Westling var. *echinulatum* Raper and Fennell, FAT 987, conidia showing the characteristically echinulate or verruculose walls and the glabrous to subglabrous forms.

47. *Penicillium urticae* Bainier.



Fig. M-47. *Penicillium urticae* Bainier, FAT 1315, detail of penicilli

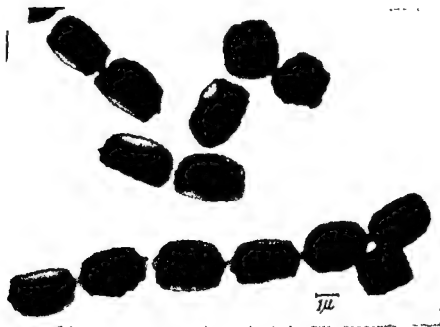


Fig. E-47. *Penicillium urticae* Bainier, FAT 1315, conidia showing the smooth or nearly so walls and the typically elliptical form

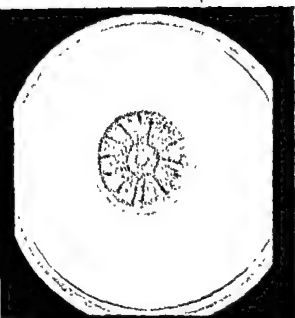


Fig C-47. *Penicillium urticae* Bainier, FAT 1315, on Czapek agar, 10 days

フエック大培養に於ける集落の発育は 25°C にて 5 日 14~15 mm, 10 日 30~32 mm (Fig C-47), 20 日 50~52 mm, 30°C 10 日 30~32 mm, 37°C 発育不能, 放射状を有し, 表面は明瞭な顆粒状, 質を来状で, 集落周囲部には著しい来状を呈す, 白色, 約 10~12 mm 幅; 分生胞子着生全面的, 分生胞子着生部は暗緑色調; 産出物は僅小, くすんだ黄色又は橙褐色調; 集落表面はくすんだ黄色又は橙褐色調, 集落周辺又は薄褐色調に着色; ヘニラスは不整着生状, 散開状様, 比較的大型で, 形, 各サイズは変化する (Fig M-47), ボデーの所より各微細構造をもった分枝が各種に分岐している, 分生胞子着生は一面と来状, 又は来状に平立し, 波状にうねり, 曲っており, 180~600 μ \times 40~47 μ , 頂端部 43~53 μ , 前部, 分枝は散開状に着生し, 106~22 μ \times 31~43 μ , 基盤部は散開状様に 2~4 ケ群生し, 比較的短く, 62~75 μ \times 25~34 μ , 頂端部 28~39 μ , 梗は特徴的に短く, 53~63 μ \times 18~26 μ , 梗基部に 3~5 又は以上群生; 分生胞子楕円, 28~36 μ \times 21~28 μ , 前部, 分生胞子顕微鏡写真 (Fig E-47) にても同一様又は 0.1 μ 以下の僅小粗面, 分生胞子連鎖は円柱状又は散開状, 長さ 60~120 μ

ステイブル大培養に於ける集落の発育は 25°C にて 5 日 18~20 mm, 10 日 43~47 mm, 20 日 53~56 mm, 30°C 10 日 40~42 mm, 37°C 発育不能; 他の諸特性は上記同一様

動物性大培養に於ては特異的に発育不能 本菌は土壌及び飼料変異等より分離

47. *Penicillium urticae* Bainier.

Colonies on Czapek agar growing restrictedly, attaining a diameter of 30 to 32 mm in 10 to 12 days at 25°C, 30 to 32 mm at 30°C (Fig C-41); seldom growing at 37°C, (growing little or not on NO_3 -medium); radiately furrowed in most strains, surface distinctly granular in most strains, typically fasciculate with prominent fascicles usually produced at least in the marginal areas, heavily sporing throughout, with white margin

colors; odor distinctive and fragrant in some strains, not pronounced in others; reverse dull yellow or orange cinnamon shades, with surrounding agar pale cinnamon color pigmented, penicilli asymmetric and biverticillate, loosely divergent, comparatively large but extremely variable in pattern and dimensions (Fig M-47); and various branched with bearing elements commonly arising at different levels, conidiophores partly in fascicles, partly simple, undulate or sinuate, commonly ranging up to 180 to 600 μ by 40 to 47 μ with apices somewhat enlarged up to 43 to 53 μ , with smooth or nearly so; branches divergent but commonly 106 to 22 μ by 31 to 43 μ ; metulae loosely compact verticils of 2 to 4, comparatively short mostly 62 to 75 μ by 25 to 34 μ , with apices 28 to 39 μ , sterigmata characteristically short, mostly 53 to 63 μ by 18 to 26 μ , loosely compact verticils of 3 to 5 or more, conidia typically elliptical, mostly 28 to 36 μ by 21 to 28 μ , with smooth or nearly so walled, and the smooth or slightly rough walls are shown by electron microscopy (Fig E-47), conidial chains loosely column or divergent, up to 60 to 120 μ in length

Colonies on steep agar somewhat more rapidly than on Czapek, 43 to 47 mm in 10 to 12 days at 25°C, 40 to 42 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek.

Strains of this species isolated from soils and diseased rice

*Banner G. Bul. Soc. Mycol. France 23 P 1 V, Figs 10 to 16 1907

**Thom C. The Penicillia pp 418 419 1930

***Raper, A. B. Thom C. and Fennell D. I., A Manual of the Penicillia pp 534 537 1949

****Abe, S. J. Gen. Appl. Microbiology 112 113 1956

48. *Penicillium expansum* (Link) Thom



Fig. M-48 A. *Penicillium expansum* (Link) Thom, FAT 736, low power view of colony section showing tangled or loosely parallel of conidial chains.



Fig. M-48 B. *Penicillium expansum* (Link) Thom, FAT 736, detail of penicilli



Fig. 1-48. *Penicillium expansum* Link Thom, FAT 736, conidia showing the slightly rough walls and the typically elliptical form.

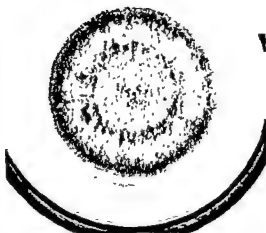


Fig. C-48. *Penicillium expansum* (Link) Thom, FAT 736, on Czapek agar, 10 days

48. *Penicillium expansum* (Link) Thom.

Colonies on Czapek agar growing rapidly, attaining a diameter of 60 to 62 mm. in 10 to 12 days at 25°C (Fig C-48); 40 to 45 mm. at 30°C; seldom growing at 37°C; (growing little or not on NO_2 medium), surface smooth or loosely furrowed, heavily sporing throughout with conidiophores very abundant and regularly arising from the substratum, in some strains occurring in an almost continuous dense stand, in others showing some definite fascicles or clusters but with the majority of the conidiophores arising singly, in still other strains with conidiophores

lanceolate, conical or pale yellow color; color strongly, moldy, reverse yellow brownish shades, with surrounding agar pinkish or lightly yellow-brownish shades pigmented; penicilli asymmetrical and biverticillate, comparatively larger (Fig. M-48), conidiophores mostly 60 to 75 μ by 3.4 to 5.0 with apices somewhat enlarged up to 4.5 to 5.6 μ in diameter, with smooth or nearly so wall; branches mostly 12.5 to 31 μ by 3.2 to 4.7 μ ; metulae usually borne in verticils of 2 to 4, loosely compact, mostly 10 to 15.7 μ by 2.8 to 4.9 μ , with apices 3.1 to 4.9 μ ; sterigmata in groups 3 to 6, loosely compact, commonly 9.3 to 15.6 μ by 2.5 to 3.1 μ , conidia typically ellipsoidal, mostly 3.1 to 4.4 by 2.5 to 3.1 μ , with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig. E-48); terminal chains tangled or loosely parallel, up to 120 to 250 μ in length.

Colonies on steep agar growing somewhat rapidly than on Czapek, 42 to 45 mm. in 10 to 12 days at 25°C; 42 to 47 mm. at 30°C; seldom growing at 37°C; the other characters as on Czapek.

Strains of this species isolated from warts and fruited

*Thom, C. U. S. Dept. Agr., Bur. Agric. Ent. Res., pp. 27-28, fig. 1, 1915. The *Penicillia* 50: 62-65, figs. 60 and 61, 1917.

*Link, H. F. *Phycomycetes*, p. 17, 1914.

***Raper, K. B., *Thom, C. and Raper, S. I. A Manual of the Penicillia* 50: 212-215, 1915.

****Abe, S., *J. Gen. Appl. Microbiology*, 11: 100, 1965.

ツァペック寒天培養に於ける集落の発育は 25°C にて 5 日 21~23 mm; 10 日 60~62 mm (Fig C-48), 20 日 68~70 mm; 30°C 10 日 40~45 mm, 37°C, 発育不能; 集落表面は平滑又は皺があり, 分生胞子の着生全面的, 分生胞子柄は豊富で規則的に基質より直立し, 又成る菌株にては連続的に根糸に直立, 又他菌株にては明確に束又は房状を呈するか単立分生胞子柄もある, 又成る菌株にては集落表面が竹状乃至顆粒状外観を呈する, 束状に分生胞子が集まっている, 集落周囲は白色約 10 mm 幅; 分生胞子着生部はくすんだ黄緑色調; 分泌物は欠又は僅小, 無色又は薄黄色調; 集落裏面は黄褐色調, 集落周辺部又は根糸又は薄黄褐色調に着色; ヘミニラスは不整齊輪生状, 比較的人型 (Fig M-48); 分生胞子柄は 60~390 μ × 3.4~5.0 μ , 頂端部 4.5~5.6 μ , 前面, 分枝は 12.5~31 μ × 3.2~4.7 μ , 基枝は 2~4 ヶ枝を群生に群生, 10 15.7 μ × 2.8~5.4 μ , 頂端部 3.1~4.9 μ , 枝は 3~6 ヶ枝を群生に群生, 9.3~15.6 μ × 2.5~3.1 μ , 分生胞子は楕円, 3.1~4.4 μ × 2.5~3.1 μ , 前面, 欠電ノ顕微鏡写真 (Fig E-48) にても 0.15 μ 以下の微小粗面, 分生胞子連鎖は粒状又は竹状, 長さ 120~250 μ , ステイプ寒天培養に於ける集落の発育は 25°C にて 5 日 22~25 mm, 10 日 62~65 mm, 20 日 70~75 mm, 30°C 10 日 42~47 mm, 37°C 発育不能, 他の諸性質は上記同様。

亜硝酸寒天培養に於ては特異的に発育不能。

本菌株は土壌又は果大類より分離する

49. *Penicillium martensii* Blourge

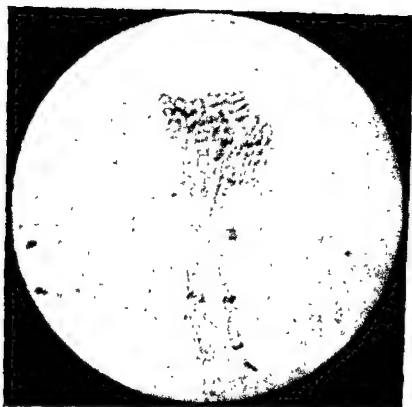


Fig. M-40. *Penicillium martensii* Bourge, FAT 1201, detail of penicilli

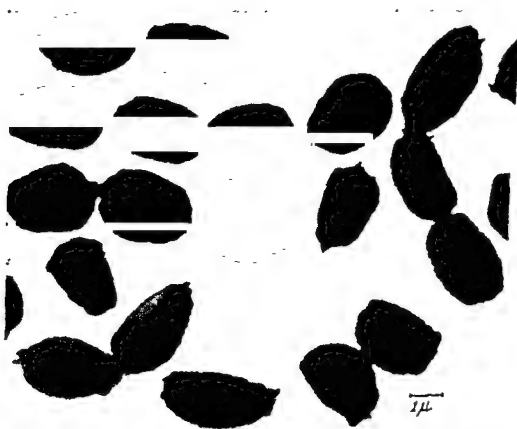


Fig. 1-40. *Penicillium martensii* Bourge, FAT 1211, spores showing the slightly rough walls and the typically elliptical or ovate form

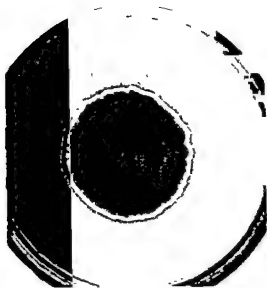


Fig. C-49. *Penicillium martensii* Biourge, FAT 1201, on Czapek agar, 10 days

ノアヘック寒天培養に於ける集落の発育は25°Cにて5日目13~27 mm, 10日目30~53 mm (Fig. C-49), 20日目55~58 mm; 30°C 10日目15~53 mm; 37°C 発育不能; 面衣束状, 平滑又は放射状皺を有し, 集落内周部は白色, 約0.5 mm 幅, 表面は顆粒状乃至は房状, 分生胞子の着生全面的, 分生胞子は集落近内周部にては青緑色又は青灰緑色調, 中心部にては濃青灰緑色調, 順次くすんだ緑色又は暗青灰色調を呈す; 滲出物は欠又は微小, 又は豊富, 荷黄色調; 集落表面は棕褐色又は赤褐色調, 順次暗褐色調, 集落周辺又は荷褐色調, 順次暗褐色調に褐色; ヘニラスは不整斉輪生状, 比較的人型, 常に主軸上に又は二ケの分枝を有す (Fig. M-49), 分生胞子柄は基質より直立し, 長さは変化に富み, 90~380 μ \times 31~50 μ , 頂端部は作かに膨大し34~56 μ , 滑面, 分枝は変化に富み, 112~22 μ \times 29~45 μ , 基底梗子は3~4 μ 縦密状様に群生し, 81~125 μ \times 25~41 μ , 梗子は4~7 μ 縦密状又は短臥様に褐色, 68~94 μ \times 21~31 μ , 先端部幾分か細い; 分生胞子は楕円又は卵形, 31~42 μ \times 21~33 μ , 滑面, 又電子顕微鏡観察 (Fig. E-49) にては0.1 μ 以下の微小相面, 分生胞子連鎖は粒状又は多行状様, 長さ60~200 μ

ステイブス寒天培養に於ける集落の発育は25°C, 5日目14~33 mm, 10日目34~56 mm, 20日目65~66 mm, 30°C 10日目11~54 mm, 37°C 発育不能, 他の特性は上記の如く。

寒天塊寒天培養に於けるノアヘック寒天同様良好なる発育を示す

本菌株は麦芽汁寒天にても良好な発育を示す (Fig. 1-1) 及び腐敗果実類より分離さる

49. *Penicillium martensii* Biourge

Colonies on Czapek agar growing somewhat restrictedly or rapidly, attaining a diameter of 30 to 53 mm in 10 to 12 days at 25°C (Fig. C-49); 15 to 53 mm at 30°C; seldom growing at 37°C; (growing very well on NO₂-medium); typically fasciculate, smooth or radial furrowed with a white margin about 0.5 mm wide, with surface appearing granular to definitely tufted, heavily sporing throughout, conidial areas blue green or bluish gray green shades near Deep Bluish Glauous in marginal areas and Artmesia Green or Deep Bluish Gray Green in central areas, becoming Sage Green or Dark Bluish Gray Green; exudate lacking or limited, abundantly, pale yellow color; odor often pronounced, moldy; reverse orange brown or reddish brown shades, becoming blackish brown shades, with surrounding agar light brownish color, becoming dark brown color pigmented, penicilli asymmetrical and biverticillate, comparatively large, usually showing one or two branches in addition to the main axis (Fig. M-49); conidiophores arising from the substratum, variable in length but commonly ranging from 90 to 380 μ by 31 to 50 μ with apices somewhat enlarged up to 34 to 56 μ , with walls smooth or nearly so, branches variable, mostly 11.2 to 22 μ by 2.9 to 4.5 μ , metulae commonly 3 to 4 in the verticils, loosely compact, about 8.1 to 12.5 μ by 2.5 to 4.1 μ ; sterigmata usually in clusters of 4 to 7, compact or loosely compact, measuring 6.8 to 9.4 μ by 2.1 to 3.1 μ , with apices somewhat narrowed, conidia typically elliptical or ovate, mostly 3.1 to 4.2 μ by 2.1 to 3.3 μ , with walls smooth or nearly so, and the slightly rough walls are shown by electron microscopy (Fig. E-49); conidial chains loosely tangled or parallel, up to 60 to 200 μ in length. Colonies on steep agar growing more rapidly than on Czapek, 34 to 56 mm in 10 to 12 days at 25°C, 11 to 54 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek.

Colonies on malt agar growing rapidly and luxuriantly growth

Strains of this species isolated from soils and spoiling fruits

*Biourge, Pii Monograph La Cellule 13 fasc 1 pp 119 121 Col P1 1 fig 5 1923

**Thom, C The Penicillia, pp 312 317 1930

***Raper, K B Thom C and Fennell, D I A Manual of the Penicillia pp 500 503 1949

****Abe S J Gen Appl Microbiology 113 114 1956

50. *Penicillium italicum* Wehmer



Fig. M-50. *Penicillium italicum* Wehmer, FAT 774, detail of penicilli



Fig. M-50. *Penicillium italicum*

Wehmer, FAT 774, a typical exoconidial

structure

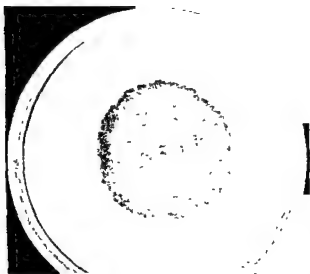


Fig. C-50. *Penicillium italicum* Wehmer, FAT 774 on Czapek agar, 10 days

50 *Penicillium italicum* Wehmer

Colonies on Czapek agar growing rapidly, attaining a diameter of about 47 mm in 10 to 12 days at 25°C (Fig C-50); about 40 mm at 30°C; seldom growing at 37°C; (growing very well on NO_2 medium); smooth and central area commonly raised, typically fasciculate, becoming developing coremia, with a white margin about 0.2 to 0.5 mm wide, conidial areas in bluish green shades near Bluish Gray Green shades in marginal areas and Dark Yellowish Green shades in central areas, becoming to Dark Russian Green and Leaf Green, exudate lacking or very limited, yellowish color; odor fragrant, suggesting perfume, variously diagnosed as lavender or lilac; reverse dull yellow shades, with surrounding agar colorless, penicilli asymmetric and biverticillate, comparatively long, usually consisting of the main axis 1 to 3 branches variously produced at the upper nodes of the stalk (Fig M-50); conidiophores arising from the substratum or occasionally from superficial hyphae on or near the agar surface, variable in length up to 120 to 300 μ by 3.5 to 4.8 μ , with apices somewhat enlarged up to 4.2 to 5.5 μ , with walls smooth or nearly so, branches variable, mostly 14 to 27 μ by 3.0 to 4.5 μ , apices 4.0 to 5.5 μ ; metulae commonly 2 to 4 in the verticils, loosely compact, variable, about 14 to 22 μ by 3.0 to 4.2 μ , sterigmata usually in cluster of 4 to 6, loosely compact, measuring 8.3 to 12.4 μ by 2.7 to 3.5 μ , conidia typical cylindrical, mostly 3.4 to 5.8 μ by 2.8 to 3.7 μ , occasionally larger up to 8.7 μ by 3.1 to 3.8 μ , with walls smooth or nearly so, and the slightly rough walls are shown by electron microscopy (Fig E-50), conidial chains tangled or loosely parallel, up to 60 to 180 μ in length

Colonies on steep agar growing more rapidly than on Czapek, about 64 mm in 10 to 12 days at 25°C, about 68 mm at 30°C, seldom growing at 37°C, conidial areas darker blue-green shades near Russian Green, the other characters as on Czapek.

Strains of this species isolated from soils and diseased fruits

*Wehmer C. Beitr. Kenntn. Fähr. Pilze, II pp. 63 72 Taf. I fig. 13 Taf. II fig. 17, Jena 1935

**Thom C. The Penicillia pp. 412 414 hg. 63 1930

***Kaper A. B. Thom, C. and Fennell D. J. A. Manual of the Penicillia pp. 526 529 1949

****Abe, S. J. Gen. Appl. Microbiology 114 115 1956

ノアヘック大培表に於ける集落の発育は25°Cにて5日約25 mm, 10日約47 mm (Fig C-50), 20日約40 mm, 30°C 10日約40 mm, 37°C発育不能; 集落の中心は隆起, 菌糸は束状, 類糸束状を呈す, 集落の中心は白色, 0.2~0.5 mm 巾, 分生胞子生じ部は近円周状にては青緑色調, 中心部は暗黄緑色, 類糸束状, 又はくすんだ青緑色調を呈す, 発出物は欠又は微小, 黄色調, 集落表面は黄色調, 集落周辺部人は無色; ヘミシラスは不整斉輪生状, 比較的長く, 主軸上に1~3ヶの各種分枝を有す (Fig. M-50), 分生胞子柄は草質又は短々大表面又は近くの糸束より直立, 120~300 μ ×3.5~4.8 μ , 頂端部4.2~5.5 μ , 断面, 分枝は変化に富み, 14~27 μ ×3.0~4.5 μ , 頂端部4.0~5.5 μ ; 基質は2~4ヶ枝を呈す, 14~22 μ ×3.0~4.2 μ , 梗々4~6ヶ枝を呈す, 8.3~12.4 μ ×2.7~3.5 μ , 分生胞子は長楕円形, 3.4~5.8×2.8~3.7 μ , 梗々大型5.0~8.7×3.1~3.8 μ , 断面, 主軸部顕微鏡写真 (Fig E-50) にても0.1 μ 以下の微小粗面, 分生胞子連鎖は散在又は平行状, 長さ60~180 μ

ステイフ大培表に於ける集落の発育は25°Cにて5日約40 mm, 10日約64 mm, 20日約68 mm, 30°C 10日約68 mm, 37°C発育不能, 分生胞子生じ部は暗黄緑色調, 他の諸特性は上記同様

亜硝酸大培表にてはノアヘック大培表同様発育良好

本菌株は土壌又は糞変果大類より分離さ

51. *Penicillium corymbiferum* Westling



Fig. M-51 A. *Penicillium corymbiferum* Westling, FAT 606, low power view of colony section showing typically coremia.

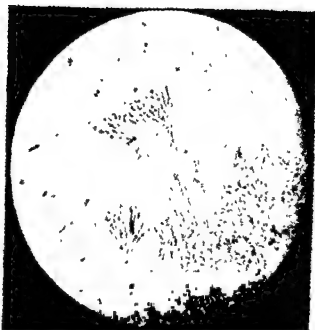


Fig. M-51 B. *Penicillium corymbiferum* Westling, FAT 606, detail of penicilli.

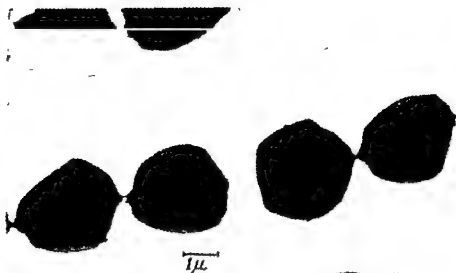


Fig. E-51 *Penicillium corymbiferum* Westling, FAT 606, conidia showing the slightly rough walls and the glabrous to subglabrous form.

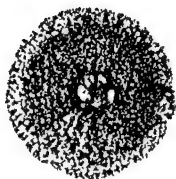


Fig. C-51. *Penicillium corymbiferum* Westling, FAT 606, on Czapek agar, 10 days

ノアヘックル人培養に於ける集落の発育は25°Cにて5日目約25mm, 10日目約42mm, 20日目約70mm, 30°C 10日目約23mm; 37°C 発育不能。集落表面は粗雑な顆粒状又は液状外観で分生胞子柄が集落の周囲部にては容易に見分けのつく束状に集合し、菌叢は束状で結束束状 (Fig C-51), 平滑又は小さな輪郭状発育を示し、集落の周囲部は束状、顆粒状外観を呈し、白色、約15mm 巾、分生胞子系生部は黄緑色調、順次黄緑色、又は濃黄緑色調を呈す; 滲出物は豊富、無色又は黄色調、集落表面は黄又は黄褐色調、順次桃、又は褐色調を呈し、集落の周囲部は無色、ヘニラスは不整斉輪生、比較的人型 (Fig M-51), 分生胞子柄は長さ変化にとり、60~500 μ ~1 \times 40~58 μ , 担端部46~62 μ , 顆粒状粗面、分枝は短々内分枝し、2化に富み、11~30 μ \times 40~56 μ , 芽胞抱持は4~5ヶ粒束状に群生、93~156 μ \times 31~43 μ , 担端部37~50 μ , 抱持3~7ヶ行縦様に着生、87~106 μ \times 21~30 μ , 分生胞子球形又は亜球形、25~35 μ , 滑面、又電子顕微鏡写真 (Fig E-51) には0.1 μ 以下の微小粗面、分生胞子連鎖は鎖状、長さ120~250 μ

ステーブバ人培養に於ける集落の発育は25°Cにて5日目約27mm 10日目約73mm, 20日目約74mm, 30°C 10日目約30mm, 37°C 発育不能。集落表面は 暗褐色、他の諸特性は上記の如く。

亜硝酸ベン培養に於いては特異的に発育不能

本菌種は土壌又は堆肥より分離さる

51 *Penicillium corymbiferum* Westling

Colonies on Czapek agar growing rather rapidly spreading, attaining a diameter of about 42 mm. in 10 to 12 days at 25°C; about 23 mm. at 30°C; seldom growing at 37°C; (growing little or not on NO₂ medium), typically fasciculate and abundant coremia with colony surface appearing coarsely granular or ridged and with the majority of conidiophores aggregated into clearly defined bundles easily viewed at the colony margin (Fig. C-51), smooth and slightly zonate, with growing margin fascicle, granular appearing, white about 15 mm. wide, conidial areas yellow-green shades near Deep Dull Yellow Green, becoming Empire Green or Dark American Green; exudate abundantly, colorless or yellowish colors, odor variable, generally not pronounced, reverse yellow or yellow-brown shades, becoming pinkish or brownish shades, with surrounding agar colorless; penicilli asymmetrical and biverticillate, comparatively large (Fig M-51); conidiophores variable in length, 60 to 500 μ or more by 40 to 58 μ , with apices somewhat enlarged up to 46 to 62 μ in diameter, with granular walled, branches occasionally rebranched, variable, commonly 11 to 30 μ by 40 to 56 μ , metulae in groups of 3 to 5, loosely compact, measuring 93 to 156 μ by 31 to 43 μ , with apices 37 to 50 μ , sterigmata loosely parallel verticils of 3 to 7, mostly 87 to 106 μ by 21 to 30 μ , conidia globose to subglobose, mostly 25 to 35 μ , with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-51), conidial chains tangled, up to 120 to 160 μ in length

Colonies on steep agar growing more rapidly than on Czapek, about 73 mm in 10 to 12 days at 25°C, about 30 mm at 30°C, seldom growing at 37°C, typically radially furrowed; colors in colony reverse generally in duller shades, the other characters as Czapek

Strains of this species isolated from the soils and liliaceous bulbs and root crops

*Westling G. Arkiv for Botanik 11 56, 92 95, figs 16, 58 1911

**Thom C. The Penicillia pp 423 425 1930

***Raper K. B. Thom C. and Fennell D. I. A Manual of the Penicillia pp 549 544 1949

****Abu, S. J. Can Appl Microbiology 115 1956

52. *Penicillium claviforme* Bainier



Fig. M-52 A. *Penicillium clavigerum* Bainier, FAT 1266.

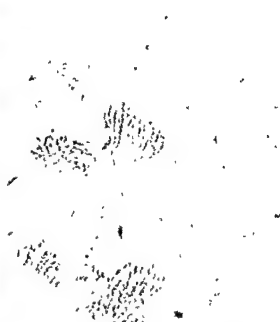


Fig. M-52 B. *Penicillium clavigerum* Bainier, FAT 1266.
enlarged view of a single conidium.

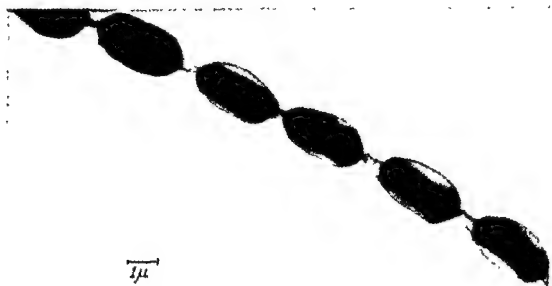


Fig. E-52. *Penicillium clavigerum* Bainier, FAT 12-5, conidia showing the smooth or nearly so walls and the elliptical or ovate form.



Fig C-52A. *Penicillium claviforme* Bainier, FAT 1266, on Czapek agar, 10 days

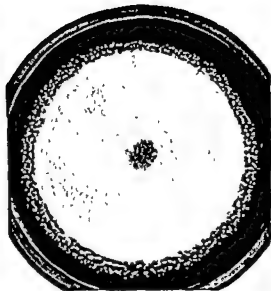


Fig. C-52B. *Penicillium claviforme* Bainier, FAT 1266, on Czapek agar, 20 days.

ノックアグア培養：集落の発育は25°Cにて5日
11 22~38 mm; 10 11 57~68 mm (Fig C-52 A),
20 11 65~73 mm (Fig. C-52 B); 30°C, 10 日
26~48 mm; 37°C, 発育不能, 集落表面は輪生状に
発育し, 菌叢は著しい束状又は結束糸状で, 結束糸
(Coremium) は恰もゴルフのクラブの形状をなし,
百数倍未満はそれ以上の分生胞子柄が束状 (Fig. M-
52 A) を呈し, その先端附近にヘニノラス (Penicil-
lus) が着生す, 直径は2~3 mm 或は幾々1 cm 又
はそれ以上, 殆んど単一分生胞子柄は生じない, 胞子
着生部の色はや、濃い青緑色又は黄緑色; 分泌物は
色富又は僅小で無色; 集落裏面はオレンシ色又は褐色
を呈し, 結束糸の下部は一切青色が強い, 集落周辺
には薄黄色で順次褐色に移行, ヘニノラス (Penicil-
lus) は分枝不整齊状 (Asymmetrical Biverticil-
late) で分枝が数段階に分枝し, 且つ大型 (Fig M-
52 B), 分生胞子柄は結束糸 (Coremia) 状に生育,
単一直立は僅少, 250~700 μ 以上 \times 3.2~5.2 μ , 平滑,
先端やや膨大し40~58 μ , 分枝は各種羽状を示し,
90~30 μ \times 28~40 μ , 基部胞子, 2~4 μ , 幾分か短
直又は多少散開状に群生, 84~13 μ \times 25~36 μ ; 梗
了, 2~5 μ 幾分か短直に群生, 91~12 μ \times 20~29 μ ,
分生胞子, 楕円又は卵形 28~38 μ \times 2.2~3.1 μ , 平
滑, 小の頭微短平頂にても平滑 (Fig E 52), 分生胞子
連鎖は巾広い塔状 (円柱状) 又は並行状 60~120 μ
以下]

スライプアグア培養 集落は25°C, 10 日 11 75~
80 mm, 30°C, 27~52 mm, 37°C, 発育不能, 他の
諸特性は同。

亜硝酸アグア培養にては特長的に発育不能。

本菌種は幾々各種土壌, 腐植, オレンシ類, 空气中,
昆虫より分離される。

52. *Penicillium claviforme* Bainier

Colonies on Czapek agar growing broadly, at-
taining a diameter of 57 to 68 mm in 10 to 12
days at 25°C (Fig C-52 A and B), 26 to 48 mm
at 30°C seldom growing at 37°C.

variously branched commonly measuring 2 to
3 mm in height but occasionally up to 1 cm or
more, and terminated by clavate conidia or

produced colorless, reverse orange or brown,
darker directly beneath the coremia, with sur-
rounding agar pale yellow, becoming similar or
pale brown, penicilli biverticillate and asymmet-
rical, very irregular and often larger (Fig M-52B);
conidiophores poorly defined, with walls smooth

parallel, up to 60 to 120 μ or more in length

Colonies on slant agar generally up to 10 cm

*Bainier, O. Bul Soc Mycol France 21 127, Pl XI,
fig 8 11 1905

**Thom, C. U. S. Dept Agr, Bur Anim Ind., Bul.
118, p 44 fig 10 1910, The Penicillia, pp 432 433,
fig 68 1930

***Raper, K. B. Thom, C. and Fennell, D. I., A Manual
of the Penicillia pp 549 553 1949

****Abe, S. J Gen Appl Microbiology p 116 1956.

53. *Penicillium clavigerum* Demelius.



Fig. M-53. *Penicillium clarigerum* Demelius, FAT 1161, detail of a single coremium.

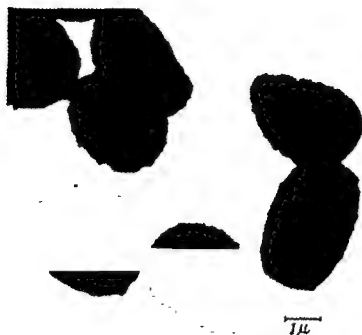


Fig. I-53. *Penicillium clarigerum* Demelius, FAT 1161, conidia showing the slightly rough walls and the typically

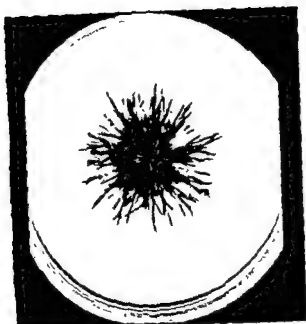


Fig C-53, *Penicillium clavigerum* Demehus, FAT 1161, on Czapek agar, 10 days.

ツァペックル人培養に於ける生菌の発育は 25°C にて 5 月 11 日約 18 mm, 10 月 11 日約 35 mm, 20 月 11 日約 60 mm; 30°C 10 月 11 日約 35 mm; 37°C 発育不仕。菌糸は生菌を全面結晶状; (Fig C-53) 14 の如くその結晶 (coremia) は長さ 2~10 mm の各種で、単一結晶は殆ど針の如き形状、菌端部は尖り、ヘニラスは中間部に多く着生、クラブ (ゴルフ使用の) 状は呈さぬ、菌糸は白又は黄色、分生胞子着生部は黄緑色調、順次褐色又はくすんだナリーブ緑色を呈す、発出物は僅小、黄色調、生菌表面は黄色調、順次、桃褐色調、生菌周辺り又は無色、順次黄色色調; ヘニラスは不整分枝状、主軸上に 1 又は 2 ケの分枝を有し、時には短枝の群のみの場合もある (Fig M-53)、分生胞子柄は長さ各種、2~10 mm \times 28~41 μ 、菌端部最大、37~44 μ 、滑面、分枝 62~156 μ \times 25~35 μ 、短枝は 2~4 ケ、板状、又は幾分か散開状様に着生、75~125 μ \times 25~35 μ 、菌端部 31~41 μ 、梗は 2~4 ケ精密状様に着生、93~125 μ \times 20~25 μ 、整齊輪状と思わしめる如き、先端が順次入る、分生胞子は円、34~44 μ \times 26~35 μ 、滑面、表皮に顕微鏡状 (Fig E-53) にても 0.1 μ 以下の僅かな粗面、分生胞子連鎖は球状、又は円柱状、長さ 30~120 μ 、ステイプス人培養に於ける生菌の発育は 25°C にて 5 月 11 日約 22 mm; 10 月 11 日約 47 mm、20 月 11 日約 60 mm、生菌表面は暗褐色、順次褐色を呈す、ヘニラスは一材部離な分枝を小し、他の諸特性は 1 2 11 11

菌培養人培養に於いてはノアヘノ人同様に好なる発育を示す。

本菌は「」より分離さる。

53 *Penicillium clavigerum* demehus

Colonies on Czapek agar growing somewhat restrictedly, attaining a diameter of about 35 mm in 10 to 12 days at 25°C, about 35 mm at 30°C, seldom growing at 37°C, (growing very well on NO₂ medium), very strongly fasciculate throughout with the coremium aspect dominating the entire colony, coremia Isaria like, simple (Fig C-53), rounded or more or less flattened and even spray-

usually pointed and with penicium more concentrated in terminal portions, but generally borne over their entire length, coremia seldom clavate and rarely showing a clear differentiation into stalk and spore bearing areas, white at first but developing yellow green shades near American Green, becoming similar or Slate Olive, exudate limitedly, dull yellow colored, odor pronounced, moldy, reverse yellow shades, becoming pinkish brown shades, with surrounding agar colorless, becoming yellow shades, penicilli abundantly produced, asymmetric, commonly showing one or two branches in addition to the main axis, but infrequently bearing a single terminal verticil of metulae (Fig M-53), conidiophores variable in length, mostly very long up to several millimeters, about 2 to 10 mm by 28 to 41 μ , apices somewhat enlarged up to 37 to 44 μ , with smooth or nearly so walled, branches mostly 62 to 156 μ by 25 to 35 μ , metulae usually in groups of 2 to 4, loosely compact or somewhat divergent, measuring 75 to 125 μ by 25 to 35 μ , apices 31 to 41 μ , sterigmata loosely compact, commonly borne in cluster of 2 to 4, mostly 93 to 125 μ by 20 to 25 μ , gradually tapered to conidium bearing tips in a manner suggestive of the Biverticillate Symmetrica, conidia typically elliptical, 34 to 44 μ by 26 to 35 μ , with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-53), conidial chains loosely tangled or column up to 30 to 120 μ in length.

Colonies on steep agar growing more rapidly than on Czapek about 47 mm in 10 to 12 days at 25°C, about 45 mm at 30°C, seldom growing at 37°C, reverse in dark walnut to almost black shades, penicilli with parts generally as described above but usually more complexly branched, the other characters as on Czapek.

*Strains of this species isolated from soils

*Demehus P. Verhandl. Zool. Bot. Gesellschaft Wien 72

74 75 fig 4 1923

**Thom C. The Penicillia p. 427 1930

***Raper B. B. Thon C. and Fennell D. J. A Manual of the Penicillia pp. 553 555 1949

***Abc N. J. Gen. Appl. Microbiology 117 1976

54. *Penicillium wortmanni* Klocker.



Fig. M-51A. *Penicillium wortmanni* Klocker, FAT 361, detail of a single penicillus

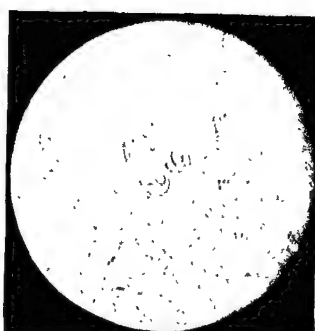


Fig. M-51B. *Penicillium wortmanni* Klocker, FAT 361, two asci contain ascospores

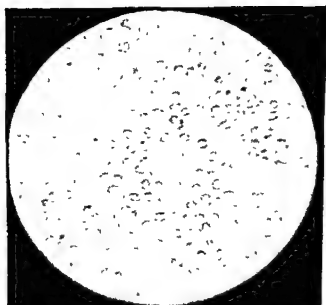


Fig. M-51C. *Penicillium wortmanni* Klocker, FAT 361, numerous mature ascospores



Fig. L-51. *Penicillium wortmanni* Klocker, FAT 361, asci showing the slightly rough walls and the "H" shaped or brown form with ends often poorly made or less pointed

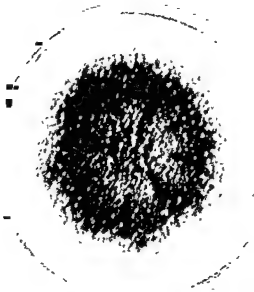


Fig C-54 *Penicillium wortmanni* Klockner, FAT 364, on Czapek agar, 10 days.

ノアヘック大天培養に於ける生菌の発育は 25°C にて 5 日目約 18 mm, 10 日目約 30 mm, 20 日目約 67 mm, 30°C 10 日目約 35 mm, 37°C 10 日目約 12 mm, 各菌株にて着色及び菌叢は各種, 一般的に僅小な綿毛状又は繻状で硬い菌糸帯を有す, 放射状様の数があり, 生菌周囲部は約 0.5 mm 巾白色; 中心部にては黄色菌糸と青緑又は黄赤色分生胞子体とが輪層状又は共に発育, 又或る菌株にては分生胞子を豊富に作り, 又他菌株にては分生胞子が僅小か又は作らず, 順次黄褐色調, 赤褐色調又は僅小; 生菌裏面は塊状色又は絹状色調, 生菌周囲部又は無色, ヘニラスは整齊輪生状 (Fig M-54A), 分生胞子柄は材質より生育し, 30~130 μ 以上 \times 25~32 μ , 頂端部は幾分か膨入, 3.1~4.3 μ , 頂面, 基底胞子は繻密状に 4~7 ケ群生し, 9.3~12.5 μ \times 2.3~3.0 μ , 柄子 4~7 ケ近接並行状に前生, 10~12.5 μ \times 1.8~2.4 μ , 柄鋒状で先端鈍る, 分生胞子は柄門又はレモン形で多少端が細い, 2.8~3.4 μ \times 1.8~2.5 μ , 頂面, 電子顕微鏡写真 (Fig E-54) にては 0.1 μ 以下の小断面, 分生胞子連鎖は繻状, 長さ 60~95 μ , 被了器は僅小又は豊富に約 20 日目には形成 (Fig C-54), そのサイズは各種, 楕円又は亜球形, 一般に 240~700 μ \times 190~500 μ , 黄色調菌糸にて覆われ, (asci) 下数は卵形, 又は亜球形, 8~12 (Fig M-54B) 8 ケ (ascospore) 子囊胞子を有す, 子囊胞子は楕円, 小柄状断面, 3.4~5.6 μ \times 2.8~3.7 μ (Fig, M-54C), 無色, ステープ大天培養にては 25°C にて 5 日目約 22 mm, 10 日目約 34 mm, 20 日目約 76 mm; 30°C 10 日目約 40 mm; 37°C 10 日目約 14 mm, 他の諸特性は 1 記同様に。

本菌株は上層又は厚層より分離さる。

51. *Penicillium wortmanni* Klockner

Colonies on Czapek agar growing rather restrictedly, attaining a diameter of about 30 mm in 10 to 12 days at 25°C, about 35 mm at 30°C, seldom growing at 37°C; (growing fairly well on NO₂ medium), varying markedly in color and texture depending upon the individual strain, commonly consisting of a tough mycelial felt with surface often appearing slightly floccose or funiculose, loosely radial furrowed, with growing margin white, about 0.5 mm wide, and with central areas showing zones of either yellow mycelium or blue-green, yellow green conidial heads, or both, in some strains producing abundant conidia, in others showing few or no conidial heads and usually becoming yellow-orange, exudate lacking or limitedly, clear; odor suggesting of mushrooms; reverse in pinkish orange to tawny shades, with surrounding agar colorless, penicilli typically biverticillate and symmetrical (Fig M-54A), conidiophores arising primarily from the substratum, up to 30 to 130 μ or more by 2.5 to 3.2 μ , with apices somewhat enlarged up to 3.1 to 4.3 μ , with smooth or nearly so walled; metulae in compact verticils of 4 to 7, about 9.3 to 12.5 μ by 2.3 to 3.0 μ , sterigmata closely parallel, in clusters of 4 to 7, mostly 10 to 12.5 μ by 1.8 to 2.4 μ , lanceolate with the terminal portion characteristically tapered, conidia elliptical or lemon form with ends commonly more or less pointed, mostly 2.8 to 3.4 μ by 1.8 to 2.5 μ , with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-54); conidial chains loosely tangled, up to about 60 to 95 μ in length, perithecia produced in limited or abundantly (Fig C-54) in about 20 days, varying greatly in dimensions, elliptical or subglobose, commonly 240 to 700 μ by 190 to 500 μ , surrounded by loose mantles of heavily encrusted and strongly yellow pigmented hyphae, asci abundantly produced throughout a loose hyphal network, borne in short chains, oval to sub-spherical, about 8 to 12 μ in diameter, 8-spored (Fig M-54B), ascospores elliptical, spinulose over their entire surface (Fig M-54C), mostly 3.4 to 5.6 μ by 2.8 to 3.7 μ , colorless or nearly so.

Colonies on steep agar growing restrictedly, about 34 mm in 10 to 12 days at 25°C; about 40 mm at 30°C, about 14 mm at 37°C, the other characters as on Czapek.

Strains of this species isolated from soils and duffs

*Klockner A., Compt Rend Lab Carlsberg 6 100 1903

**Bourge Pn Monograph La Cellule 33 fasc 1 pp 243 244 1923

***Thom C. The Penicillia pp 419-430 1930 mycologia 27 133 135, fig 1 1935

****Raper K. B. Thom C. and Fennell D. I. A Manual of the Penicillia, pp 593 596 1919

*****Abe, S. J Gen Appl Microbiology P 118 1956

55. *Penicillium duclauxi* Delacroix



Fig. M-55 A. *Penicillium duclauxi* Delacroix, 1293, low power view of colony section showing typical coremia.

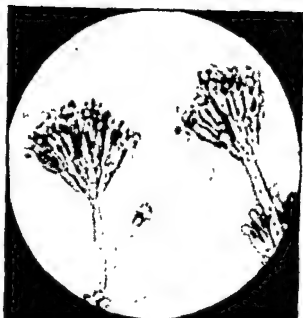


Fig. M-55 B. *Penicillium duclauxi* Delacroix, FAT 1293, detail of penicilli.



Fig. I-55. *Penicillium duclauxi* Delacroix, FAT 1293, coremia showing the slightly rough walls and the apical or basal coremia form.



Fig C-55. *Penicillium duclauxii*, Delacroix, FAT 1293, on Czapek agar, 10 days

ツェペック大培養に於ける集落の発育は 25°C にて 5 日目約 15 mm; 10 日目約 32 mm (Fig C-55), 20 日目約 70 mm, 30°C, 10 日目 28 mm; 37°C, 約 3 mm; 菌叢は著しい束状で 1~15 mm の高さの結糸状、放射状の叢を有し、薄黄、薄黄緑、薄緑、赤色調の菌糸が塊、又は総状に発育、分生胞子着生部は黄緑色調、順次オリーブ黒色を呈す、滲出物は欠又は僅小、無色又はくすんだ黄或は薄褐色調、集落表面は最初は黄色、次に橙褐、橙赤色、順次赤色又は褐色調、集落周辺又は上記同様薄赤色調に着色; 分生胞子解は結糸系又は菌叢系の総状に生育、一般的に基質より直立しているのは無い、200~300 μ 以上 \times 3.1~4.2 μ 、頂端部は、3.7~4.3 μ 、滑面、ヘミノラスは整齊を以て、前状の梭子の着生を持つ基底梗の単一軸性を有す (Fig M-55)、時々断片的に再分枝が幾分一方向的に現れる、基底梗はは線索な並行状に 4~6 μ 着生、10.6~13.7 $\mu \times$ 2.8~3.7 μ ; 梗は線索な並行状に 3~6 μ 着生、11.0~12.5 $\mu \times$ 2.1~2.7 μ ; 分生胞子は楕円又は紡錘形、3.1~4.1 $\mu \times$ 2.1~3.0 μ 、滑面、電子顕微鏡写真 (Fig E-55) には 0.1 μ 以下の作イ粒面、分生胞子連鎖は並行状又は放射状、長さ 120~200 μ

ステープル大培養に於ける集落の発育は 25°C にて 5 日目約 28 mm; 10 日目約 45 mm; 20 日目約 70 mm, 30°C, 10 日目約 42 mm, 37°C, 10 日目約 3 mm, 他の諸特性は上記同様、
事前培大培養に於ける発育はツェペック大培養と同様
に良好

本菌株は「増又は腐敗物より分離さる。

55 *Penicillium duclauxii*

Colonies on Czapek agar, 10 to 12 days at 25°C, about 3 mm at 30°C, about 3 mm at 37°C, very well on NO₂ radial furrowed, faintly in pale yellow or reddish shades, abundant masses of mycelium, conidia near Dull Black, colorless or dull, odor limited, variously colored brown or orange-red, Brazil Red or brownish, agar similarly colored, spores arising perithecia, aerial hyphae, less on substratum, variable in size or more by 3.1 to 4.2 μ , with smooth or nearly smooth, biverticillate and symmetrica, consisting of a single terminal verticil of metulae (Fig M-55)

pattern of the group, metulae usually in verticils of 4 to 6, closely parallel, measuring 10.6 to 13.7 μ by 2.8 to 3.7 μ , sterigmata closely parallel, 3 to 6

and the slightly rough walls are shown by elec-

on Czapek, about 45 mm in 10 to 12 days at 25°C; about 42 mm. at 30°C, about 3 mm at 37°C, the other characters similar as on Czapek

Straus of this species isolated from soils and deteriorating materials

*Klocker, A., Compt Rend Lab Carlsberg 6 100 1903

**Bourge, F., Monograph La Cellule 33 fasc 1 pp 243 244 1923

***Thom, C., The Penicillia, pp 449 450 1930 Mycologia 27 133 135, fig 1 1935

****Raper, K B, Thom, C., and Fennell D I, A Manual of the Penicillia, pp 553 556 1949

*****Abe, S., J Gen Appl Microbiology 118 1956

56. *Penicillium funiculosum* Thom

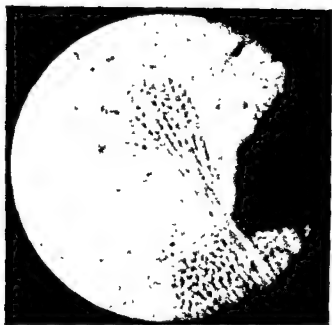


Fig. M-56 A. *Penicillium funiculosum* Thom, FAT 71, detail of a single penicillus



Fig. M-56 B. *Penicillium funiculosum* Thom, FAT 71, low power view of colony section showing typical funiculate character of texture.



Fig. M-56 C. *Penicillium funiculosum* Thom, FAT 71, low power view of basally parallel or tapered conical chains

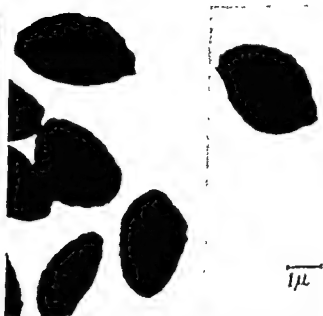


Fig. M-56 D. *Penicillium funiculosum* Thom, FAT 71, spores showing the slightly rough walls and elliptical form

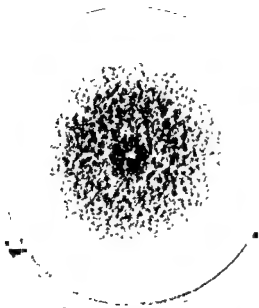


Fig. C-56. *Penicillium funiculosum* Thom, FAT 71, on Czapek agar, 10 days

56. *Penicillium funiculosum* Thom

Colonies on Czapek agar growing broadly, commonly 63 to 70 mm in 10 to 12 days at 25°C (Fig C-56), 70 to 72 mm at 37°C; about 5 to 10 mm at 37°C; (growing characteristically little or not on NO_2 -medium), typically funiculose, smooth, zonate, variable in color depending upon the relative amounts of vegetative mycelium and conidial structures and the pigmentation of the underlying agar, in some strains white to pink or flesh shades, in others developing yellow to orange or red colors with some encrustment of aerial hyphae, with margin about 5 mm, white or pale yellow color; sporulating irregularly, often heaviest in central and marginal colony areas, conidial areas in yellow green shades near Dull Blackish Green, becoming Dusky Olive Green to Slate Olive, but with colors of conidial areas often altered or obscured by pigmented hyphae, exudate lacking, limited or abundantly colorless or pale yellow colors; odor lacking or mold, slightly earthy, reverse variable, marginal areas colorless becoming yellow shades, central areas near Brazil Red, Pansy Purple, becoming Hessian Brown Shades, with surrounding agar usually conidiophores arising mainly at right angles from funiculose hyphae, often very short, in marginal areas sometimes arising directly from the substratum, ranging from 60 to 120 μ or more by 25 to 34 μ , with apices somewhat enlarged up to 31 to 11 μ with smooth or nearly so walled, penicilli typically biverticillate and symmetrical, usually consisting of a single terminal verticil of metulae, often of different lengths, not infrequently showing individual metulae rebranched below the level of the sterigmata (Fig M56), metulae mostly 4 to 6 in the verticil, closely parallel, about 8.3 to 12.5 μ by 2.3 to 3.0 μ , sterigmata mostly in verticils of 4 to 6 closely parallel, about 10 to 12.5 μ by 1.5 to 2.5 μ , with lanceolate type, conidia fusiform or elliptical, mostly 3.1 to 3.7 by 2.1 to 2.6 μ , with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-56), conidial chains loosely parallel to tangled, up to 60 to 260 μ in length

Colonies on steep agar growing about 66 to 74 mm in 10 to 12 days at 25°C, about 70 to 73 mm at 30°C, about 5 to 8 mm at 37°C, usually heavier sporulating and more conspicuously funiculose, reverse usually showing less red, commonly in orange brown shades, margin about 15 mm wide, the other characters as on Czapek

Strains of this species isolated from soils and deteriorating materials

*Thom C. L. Dept. Agr. Bur. Ann. Ind. Bul. 118 p. 69 fig. 27 1910, The Penicillia pp. 461-471 fig. 77 1930

**Raper A. B. Thom C. and Iennell D. J. A Manual of the Penicillia pp. 621 1947

, S. J. Gen. Appl. Microbiology 113 1976

アヘック系入培養に於ける集落の発育は 25°C にて 5 月 11 日 20~22 mm, 10 月 11 日 63~70 mm (Fig C-56), 20 月 11 日 76~80 mm, 30°C 10 月 11 日 70~72 mm, 37°C 5~10 mm; 菌糸は繩状, 7 月, 輪帯状発育を呈し; 葉黄菌糸と分生胞子構成体及び下層の淡色の相対的にて各所に呈色, 或る菌株にては無色, 稀, 粉状褐色調に, 又他菌株にては粉, 赤色調に気菌糸が赤色; 集落近周部は白色又は薄黄色, 約 5 mm 中; 分生胞子着生部は中心部又は近周部に多く, 暗黄緑色無調, 順次暗オリーブ緑色又は褐色すりべ色を呈す, その呈色は随々淡黄色菌糸にて不明瞭になる, 滲出物より, 又は微小, 或は豊盛, 無色又は薄黄色調; 集落表面は変化に富み, 集落近周部は無色から黄色調, 中心部は赤色, 赤紫色調, 順次紫赤色調を呈す; 集落周辺部又は常に無色; 分生胞子柄は繩状菌糸より直角に生ず, 梗々短く, 時に内周部にては基質より直立す, 60~120 μ 以上 \times 2.5~3.4 μ , 頂端部 3.1~4.1 μ , 前部, ヘルラスは整齊輪生状で, 基枝梗子の群生を呈し, 梗々長きと短い, 時には梗のトで基枝梗子から分岐する場合もある (Fig M56), 基枝梗子は較希な並行状に 4~6 ヶ群生し, 8.3~12.5 μ \times 2.3~3.0 μ , 梗子は較希な並行状に 4~6 ヶ着生し, 10~12.5 μ \times 1.5~2.5 μ , 輪帯, 分生胞子は紡錘形又は楕円形, 3.1~3.7 μ \times 2.1~2.6 μ , 前部, 電子顕微鏡写真 (Fig E56) にては 0.1 μ 以下の微小な粗面; 分生胞子連鎖は並行状又は螺旋状, 長さ 60~120 μ

ステイブ系入培養にては 25°C にて 5 月 11 日 22~30 mm, 10 月 11 日 66~74 mm, 20 月 11 日 80 mm, 30°C 10 月 11 日 70~73 mm, 37°C 10 月 11 日 5~8 mm, 通常分生胞子着生多く且其のトで繩状菌糸, 集落表面は赤色調ではなく粉状褐色調, 集落近周部は約 15 mm 中, 他の諸特性は上記同様

集落縁の入培養にては特異的に発育不能

本菌株は土壌又は腐敗物より分離さる。

57. *Penicillium islandicum* Sopp



Fig. M-57 A. *Penicillium islandicum* Sopp, FAT 946, detail of penicilli



Fig. M-57 B. *Penicillium islandicum* Sopp, FAT 946, detail of a single penicillus

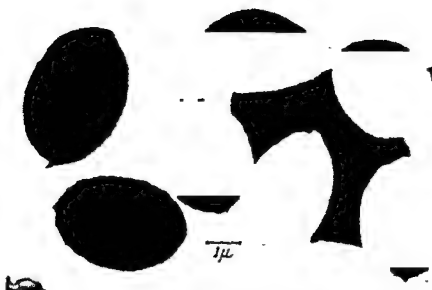


Fig. L-57. *Penicillium islandicum* Sopp, FAT 1270, conidia showing the smooth or nearly so walls and the fulvous or atypical form

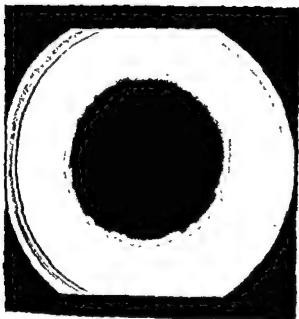


Fig. C-57. *Penicillium islandicum* Sopp, FAT 946, on Czapek agar, 10 days

ノアヘグ実天培養に於ける発育は 25°C にて 5 日目 16~18 mm, 10 日目 20~34 mm, 20 日目 46~65 mm; 30°C, 10 日目 27~37 mm; 37°C 18~23 mm; 顕著なる輪郭状発育を示し、放射状の筋を有す。菌糸は繩状、発落表面は橙、赤橙色の面々と分生胞子層構成とが部分別に又は交互の層をなし、発落内面は黄、橙、又は橙橙色調、0.2~0.5 mm, 巾 (Fig. C-57)。分生胞子着生部は暗黄緑色調、順次同色調又は黄ナリーブ色調を呈す、滲出物は僅小又は微、橙又は橙赤色或は橙褐色調; 発落裏面は橙褐色或は赤色調; 発落周辺部又は橙、赤色或は黄色調赤色; 分生胞子柄は短く気筒糸又は繩状菌糸或は時には基質より生育し、20~120 μ × 2.3~3.0 μ 。頂端部 25~37 μ 。断面; ペニララは基底梗の微かな群生を有し、時に再分枝しているが、整齊輪状構成を示し、時には分生胞子柄の下部にて第二の群生を有する場合もある (Fig. M-57)。基底梗は線状又は幾分か散開型に 5~8 μ 群生し、7.5~11.2 μ × 2.1~3.1 μ 。梗イは平行状に 3~6 μ 着生、6.8~10.6 μ × 2.1~2.8 μ 。菌状、分生胞子は紡錘形又は棒形、30~44 μ × 2.3~3.7 μ 。断面、又電子顕微鏡写真 (Fig. E-57) にて断面; 分生胞子連鎖は鏈状、長さ 60~90 μ 。

スティープ実天培養に於ける発育は 25°C にて 5 日目 17~19 mm 10 日目 26~35 mm 20 日目 59~68 mm, 30°C 10 日目 35~44 mm, 37°C 25~29 mm; 他の諸特性は上記同一様、菌類検査人培養に於ける発育は特(性的)に4能 本菌却は1類又は病変等より分離さる

57. *Penicillium islandicum* Sopp

Colonies on Czapek agar growing slow growing, attaining a diameter of about 20 to 34 mm in 10 to 12 days at 25°C, 27 to 37 mm at 30°C; 18 to 23 mm at 37°C; (characteristically growing little or not on NO₂ medium), conspicuously zonate, lightly wrinkled in a radial pattern, typical funiculate, consisting of a fairly tough felt of orange to red-orange encrusted mycelium from which arise ascending or funiculate hyphae bearing the conidiophores as short branches, with alternate zones or localized areas in which sterile hyphae or conidial structures dominate the colony surface, with yellow, orange or pinkish orange margin about 0.2 to 0.5 mm. wide (Fig. C-57); conidial areas dark yellow green shades near Dull Blackish Green or Dusky Dull Green, becoming similar shades or Yellowish Olive, exudate limited to fairly abundant, orange or orange red and orange-brown shades, odor indefinite to rather sharp, difficult to characterize, reverse in orange brown or reddish shades, with surrounding agar orange, reddish or yellow colors pigmented; conidiophores short, arising from aerial hyphae or ropes of hyphae and occasionally from the substratum, commonly 20 to 120 μ by 2.3 to 3.0 μ , with apices somewhat enlarged up to 25 to 37 μ , with smooth or nearly so walled, penicilli usually consisting of a compact terminal verticil of metulae, not infrequently branched but with the branches also terminating in typical biverticillate-symmetrical structures, occasionally with a secondary verticil lower down on the conidiophore (Fig. M-57), metulae 5 to 8 in the verticil, loosely compact or somewhat divergent, mostly 7.5 to 11.2 μ by 2.1

Colonies on steep agar growing somewhat more rapidly, 26 to 35 mm in 10 to 12 days at 25°C, 35 to 44 mm at 30°C, 25 to 29 mm at 37°C, the other characters as on Czapek

Strains of this species isolated from soils and disease rice

*Sopp, O. Monograph pp 161 164, Taf XVII, fig 122, Taf XVIII figs 25 and 26 1912

**Thom C. The Penicillia pp 464-467 1930

***Raper A. B. Thom C. and Fennell D. I. A Manual of the Penicillia pp 643 644 1949

****Abe S. J. Gen. Appl. Microbiology 119 120 1956

58. *Penicillium purpurogenum* Stoll

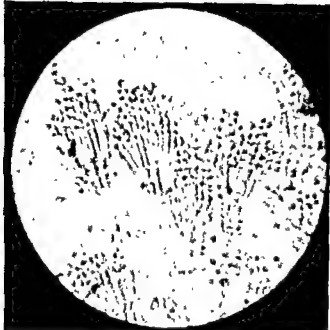


Fig. M-58A. *Penicillium purpurogenum* Stoll, FAT 1211, detail of penicilli



Fig. M-58B. *Penicillium purpurogenum* Stoll, FAT 1211, low power view of loosely parallel or tangled of conidial chains

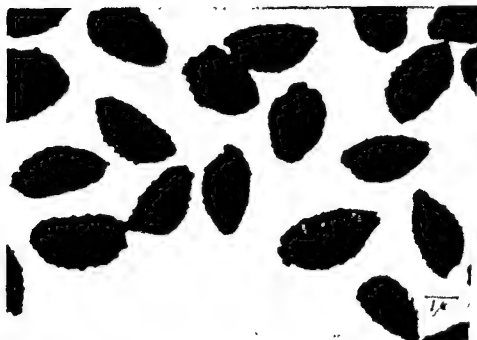


Fig. T-58. *Penicillium purpurogenum* rough warts and the cell wall

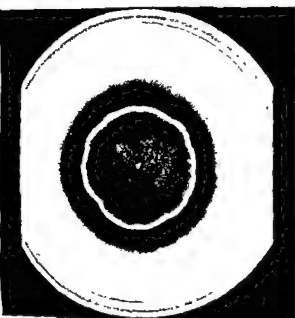


Fig. C-58 *Penicillium purpurogenum* Stoll, FAT 311, on Czapek agar, 10 days

58. *Penicillium purpurogenum* Stoll

Colonies on Czapek agar growing rather restrictedly, attaining a diameter of 22 to 41 mm in 10 to 12 days at 25°C (Fig. C-58); 25 to 54 mm at 30°C; 9 to 33 mm at 37°C, (growing very well on NO_3 medium), typical velvety or velutinous; some strains tending to become floccose, smooth, with growing margin grayish white, yellow, orange red, pink shades, about 0.2 to 4.0 mm wide, colorless, yellow, pink, orange or reddish aerial mycelium limitedly or abundantly; usually heavily sporing in central and sub-central areas, in typical yellow-green shades near Dark Dull Yellow Green, Yew Green, Dull Blackish Green, becoming similar color or Dusky Olive Green, Olivaceous Black, Dark Ivy Green, exudate lacking or limitedly, typical reddish shades near Scarlet or Brazil Red, odor indistinct or slightly moldy, reverse in strongly red or purplish red shades, with surrounding agar similarly colored in somewhat lighter shades, conidiophores arising from the substratum or sometimes from aerial hyphae, 30 to 190 μ by 25 to 41 μ , with apices somewhat enlarged up to 33 to 63 μ , with smooth or slightly granular walled, penicilli typically biverticillate and symmetrical, (Fig. M-58); metulae closely parallel, 5 to 8 in the verticil, mostly 93 to 142 μ or 188 μ by 20 to 47 μ ; sterigmata parallel, in clusters of 4 to 8, mostly 10 to 175 μ by 17 to 40 μ , lanceolate in form, characteristically tapered, conidia elliptical to ovate, 23 to 38 μ by 16 to 32 μ , occasionally larger 43 to 62 μ to 30 to 32 μ , with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig. E-58), conidial chains loosely parallel or tangled, up to 30 to 180 μ in length.

Colonies on steep agar growing more rapidly than on Czapek, 25 to 55 mm in 10 to 12 days at 25°C, 27 to 69 mm. at 30°C, 4 to 40 mm at 37°C; the other characters similar as on Czapek.

Strains of this species isolated from soils, fruits (apples), diseased rice, and other deteriorating materials in nature.

*Stoll O., Beitrage zur morphologischen und biologischen Charakteristik *Penicillium*arten, Wurzburg p. 35 Taf. I fig. 7 Taf. III, Fig. 3 Taf. IV fig. 4 1904.

**Thom, C. U.S. Dept. Agr., Bur. Anim. Ind. Bul. 118, p. 39 fig. 7 1910 and *Mycologia* 7: 134 142 1915, The *Penicillia*, pp. 478 479 1930.

***Raper, K. B. Thom, C. and Fennell, D. I., A Manual of the *Penicillia* pp. 633-636 1942.

****Abe, S. J. Gen. Appl. Microbiology 121 122 1956.

ノアヘック寒天培基に於ける集落の発育は 25°C 5 日 6~18 mm, 10 日 22~44 mm (Fig. C-58), 20 日 35~75 mm; 30°C 10 日 25~54 mm; 37°C 9~33 mm; 菌叢はヒョート状又は類似, 或る菌株にては綿毛状になる傾向を有す, 平皿, 集落内側は灰白, 黄, 橙, 橙赤, 桃色調, 巾約 0.2~4.0 mm; 黄色, 黄, 桃, 赤色調の気菌糸が厚小, 又は厚大, 分生胞子嚢は中心部又は中間部に多く, 葉片部は黄緑色調, 細小暗オリーブ緑色, ナリーブ灰色, ツヤを呈す; 産出物は又は厚小, 赤色調; 集落表面は赤色或は紫赤調, 集落周辺部人は同一色調又は多少淡色調赤色; 分生胞子嚢は基質又は時には気菌糸より生ず, 30~190 μ × 25~41 μ , 頂端部は 33~63 μ , 滑面又は厚小, 多顆粒状粗面, ヘニラスは整齊輪生状 (Fig. M-58), 基底部は近接した行状に 5~8 μ 群生し, 9.3~14.2 μ × 18.8 μ × 20~47 μ ; 梗は行状に 4~8 μ 群生し, 10~17.5 μ × 17~40 μ , 筒状, 特長的に実る, 分生胞子嚢は格円又は卵形, 23~38 μ × 16~32 μ , 卵生胞子嚢の 42~62 μ × 30~32 μ , 滑面, 電子顕微鏡写真 (Fig. E-58) にては厚小な粗面, 分生胞子連鎖は行状又は錠状様, 長さ 30~180 μ .

ステイブバ天培基に於ける集落の発育は 25°C にて 5 日 12~31 mm, 10 日 25~55 mm, 20 日 38~80 mm; 30°C 10 日 27~69 mm, 37°C 4~40 mm; 他の諸特性は 1 記同一様, 亦暗緑色天培基にてはノアヘック天同様良好なる発育を小す.

本菌株は各種土壌, 果実類 (特に柿類) 物など, 又他の腐敗物より随々分離さる.



59. *Penicillium rubrum* Stoll



Fig. M-59. *Penicillium rubrum* Stoll, FAT 727, detail of a single penicillus



Fig. M-60. *Penicillium rubrum* Stoll, FAT 727, spores showing the



Fig. C-59 *Penicillium rubrum* Stoll, FAT 727, on Czapek agar, 10 days.

フアック大培養に於ける集落の発育は 25°C にて 5 日目 3~7 mm, 10 日目 10~13 mm, (Fig C-59), 20 日目 18~23 mm; 30°C 10 日目 10~14 mm, 37°C 約 3 mm, 菌糸はピロート状, 下層又は放射状の菌を有し, 分生胞子形成体は集落全面に又は部分的に発育し, 分生胞子形成体部又は僅小部分にては黄色, 黄色, 緑色調を呈す, 集落周囲部は白, 黄色調, 巾 0.5~1.0 mm; 分生胞子形成体部は黄緑, 又は灰緑色調, 菌糸同一様又は灰青リブ色調を呈す, 産出物は菌糸は細小, 赤色又は鮮黄色調; 集落表面及周辺部は灰青, 赤色調に着色; 分生胞子柄は草質又は時には細くは気糸より生ずり, 100~190 μ × 2.0~4.5 μ , 頂端部 3.0~5.3 μ , 滑面, ヘニラスは整齊輪生状 (Fig M-59), 常に樹状様又は散開状様の 6~10 本の基枝を有す, 8.3~12.5 μ × 14.3 μ × 2.0~4.0 μ , 梗は特長的な先端の尖った輪状, 5~8 μ 程度の長さに着生, 10~12.5 μ × 1.5~2.5 μ , 分生胞子は楕円, 紡錘形又は梨形, 2.5~3.7 μ × 1.5~3.1 μ , 滑面, 電子顕微鏡観察 (Fig E-59) には 0.1 μ 以下の小粗面, 分生胞子連鎖は平行状様又は散開状様, 長さ 40~100 μ

ステープル大培養に於ける発育は 25°C にて 5 日目 5~12 mm, 10 日目 7~28 mm, 20 日目 10~28 mm, 30°C 10 日目 4~30 mm, 37°C 10 日目 3~4 mm; 他の諸性質は上述の如し。

集落形成大培養に於ては小さな胞子形成を程度の発育を示す。

本菌株は「培養」後又は採取後より分離する

59 *Penicillium rubrum* Stoll

Colonies on Czapek agar growing restrictedly, attaining a diameter of 10 to 13 mm in 10 to 12 days at 25°C (Fig C-59), 10 to 14 mm. at 30°C; about 3 mm. at 37°C, (growing and slightly sporulating on NO₂ medium), typical velvety, smooth or radial furrowed, developing abundant conidial structures throughout the colony or in localized areas, non-sporulating or lightly sporulating areas colorless or typical yellow or pink aerial mycelium abundantly, with white or yellow shades margin about 0.5 to 1.0 mm wide, conidial areas in yellow to gray-green shades near Dark American Green, Empire Green, Artmesia Green, becoming similar shades or Grayish Olive, exudate abundantly or limited, reddish to bright red in color, odor indistinct, reverse strongly reddish shades, with surrounding agar colored in lighter tints of the same shades, conidiophores arising from the substratum or sometimes from creeping or aerial hyphae, mostly 100 to 190 μ , by 2.0 to 4.5 μ , with apices somewhat enlarged up to 3.0 to 5.3 μ , with smooth or nearly so walled, penicilli biverticillate and symmetrical (Fig M-59), usually consisting of a terminal verticil of 6 to 10 metulae, loosely compact, or divergent, mostly 8.3 to 12.5 μ or 14.3 μ by 2.0 to 4.0 μ , sterigmata lanceolate with apices tapered in the manner characteristic of the group, loosely compact, in clusters of 5 to 8, mostly 10 to 12.5 μ by 1.5 to 2.5 μ , conidia elliptical, fusiform or ovate, mostly 2.5 to 3.7 μ by 1.5 to 3.1 μ , with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-59), conidial chains loosely parallel or divergent, up to 40 to 100 μ in length.

Colonies on steep agar growing about 7 to 28 mm in 10 to 12 days at 25°C, 4 to 30 mm at 30°C, about 3 to 4 mm at 37°C, the other characters similar as on Czapek.

Strains of this species isolated from soils and deteriorating materials

*Stoll, O. Beitrage zur morphologischen und biologischen Charakteristik *Penicillium*arten. Wurzburg, p. 35. Taf. I, fig. 7, Taf. III, fig. 3. Taf. IV, fig. 4. 1904.

**Thom, C. U. S. Dept. Agr. Bur. Anim. Ind., Bul. 118, p. 39, fig. 7. 1910. The *Penicillia* p. 476. 1930.

***Raper, K. B., Thom, C. and Fennell, G. I. *A Manual of the Penicillia* pp. 637, 639. 1949.

****Abe, S., *J. Gen. Appl. Microbiology* 122: 123. 1956.

60. *Penicillium aculeatum* Raper and Fennell



Fig M-60. *Penicillium aculeatum* Raper and Fennell, FAT 810, detail of penicilli



Fig L-410. *Penicillium aculeatum* Raper and Fennell, FAT 810, conidia showing the aculeate walls and the glabrous to subglabrous form

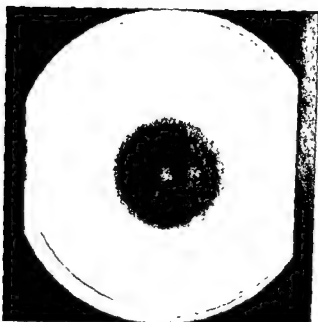


Fig. C-60. *Penicillium aculeatum* Raper and Fennell, FAT 810, on Czapek agar, 10 days

ソーベック寒天培養に於ける発育は 25°C にて 5 日目約 11 mm, 10 日目約 45 mm, 20 日目約 70 mm; 30°C, 10 日目約 54 mm, 37°C, 10 日目約 11 mm, 菌糸ビロート状, 平滑, 分生胞子無着生部には黄又は桃色調菌糸が僅小あり, 生落円周部は白色又は黄, 性色調, 巾約 20~25 mm, 分生胞子着生部は黄緑色調, 順次暗サリーブ色調を呈す; 滲出物は僅小, 赤色調 (Fig. C-60); 生落表面は赤色又は橙桃色, 順次暗赤色調を呈し, 生落周辺部は白色, 順次暗赤色調に漸小赤色, 分生胞子柄は, 状質又は菌糸帯より生ず, 90~320 μ × 25~41 μ , 頂端部幾分か膨大 40~49 μ , 表面状又は小顆粒状粗面ヘニラスは整齐輪状 (Fig. M-60), 基底梗子は膨大状又は散開状様にて 8~12 μ 群生, 106~138 μ × 25~36 μ , 表面状粗面, 梗子は根索状様に 6~8 μ 群生, 93~125 μ × 21~30 μ , 針状で中間部幾分か膨大, 分生胞子球形又は亜球形, 21~31 μ , 著しい大刺状, 又は瘤状粗面, ステリグマ微鏡写真 (Fig. E-60) にても針刺状粗面; 分生胞子連鎖は並行状又は鏈状様, 長さ 30~60 μ

スライブ寒天培養に於ける発育は 25°C にて 5 日目約 11 mm, 10 日目約 46 mm, 20 日目約 70 mm, 30°C, 10 日目約 46 mm, 37°C 10 日目約 9 mm; 他の諸特性は上記同一様, 並殖酸寒天培養に於ては僅小なる分生胞子着生を有する程度の発育を示す。

本菌種は土壌又は腐敗物より分離さる。

60. *Penicillium aculeatum* Raper and Fennell

Colonies on Czapek agar growing rather rapidly, about 45 mm in 10 to 12 days at 25°C; about 54 mm at 30°C; about 11 mm at 37°C; (growing and slightly sporulating on NO_2 -medium), typical velvety, smooth yellow or pink pigmented hyphae limitedly in non-sporulating areas, with growing margins about 20 to 25 mm wide, white to yellow or pink shades; conidial areas yellow green shades near Cerro Green, Dark American Green, becoming Dusky Olive Green; exudate limitedly, reddish shades (Fig. C-60), odor almost lacking; reverse in typical reddish shades approximating Peach Red or Orange Pink, becoming Carmine

by 25 to 41 μ , with apices somewhat enlarged

walled, sterigmata loosely compact, in clusters of 6 to 8 mostly 93 to 125 μ by 21 to 30 μ , lanceolate and somewhat swollen; conidia globose to subglobose, mostly 21 to 31 μ with conspicuously typical echinulate or verruculose walled, and the aculeate walls are shown by electron microscopy (Fig. E60), conidial chains loosely parallel or tangled, up to 30 to 60 μ in length

Colonies on steep agar growing about 46 mm in 10 to 12 days at 25°C, about 46 mm at 30°C; about 9 mm at 37°C, the other characters similar as on Czapek

Strains of this species isolated from the soils and deteriorating materials

*Raper, K. B. and Fennell D. J. *Mycologia*, 40: 535-538, fig. 10, 1948

**Raper, K. B. and Fennell D. J. *A Manual of the Fungi*, 639-642, 1949

61. *Penicillium purpurogenum* Stoll var. *rubri-sclerotium* Thom.



Fig. M-61 A. *Penicillium purpurogenum* Stoll var. *rubri sclerotium* Thom, FAT 1210, low power view of a single sclerotia.



Fig. M-61 B. *Penicillium purpurogenum* Stoll var. *rubri sclerotium* Thom, FAT 1210, detail of a single penicillus.



Fig. E-61. *Penicillium purpurogenum* Stoll var. *rubri sclerotium* Thom, FAT 1210, costia showing the slightly rough walls and the elliptical or fusiform form.



Fig. C-61 A. *Penicillium purpurogenum* Stoll var. *rubri-sclerotium* Thom, FAT 1210, on Czapek agar, 10 days

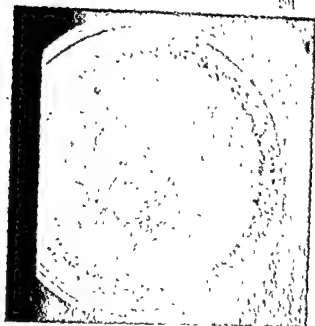


Fig. C-61 B. *Penicillium purpurogenum* Stoll var. *rubri-sclerotium* Thom, FAT 1210, on Czapek agar, 10 days

ノアヘツア入培養に於ける生落の発育は 25°C にて 5 日 11 16~33 mm, 10 日 11 55~78 mm (Fig. C-61 A), 20 日 11 73~85 mm, 30°C, 10 日 11 55~74 mm, 37°C 10 日 4~12 mm; 平落、菌叢はビロー、若しくは小さな塊状、又或る菌株には明確な種状、分生胞子無着生菌には白色又は黄褐色気味、分生小あり; 生落周囲は白色又は黄色調、径 20~30 mm; 分生胞子着生菌は黄緑色又は青緑色調、順次同一様色調又は暗緑色を呈す、分泌物は豊富又は僅小、無色、又は黄褐色、生落表面は中心部にて赤色調、生落周囲又は無色; 分生胞子の柄は基部より直立又は斜には気管より生ず、80~200 μ ~260 μ \times 2.5~4.1 μ , 頂端部 37~48 μ , 直徑又は小顆粒状粗面; ヘミノラスは整齊な塊状 (Fig. M-61), 基部便子は短棒状又は塊状、基部便子 6~12 μ 群生, 9.3~15 μ \times 2.3~3.3 μ , 頂端部 2.8~4.0 μ , 直徑状粗面、柄子は多行状柄に 4~7 μ 着生し、10~15 μ \times 1.8~3.1 μ , 斜棒状; 分生胞子は柄の又は斜棒状、2.5~3.8 μ \times 1.5~3.1 μ , 滑面、又電子顕微鏡写真 (Fig. E-61) にても 0.1 μ 以下の微小粗面、分生胞子の連鎖は直列状又は螺旋状、長さ 60~160 μ , 或る菌株には生落表面に培養約 3~4 週間後にて紅褐色又は赤色調の菌核を豊富に形成、卵球形、又は腎臓形、150~360 μ \times 120~300 μ (Fig. C-61 B), スライム入培養にての生落の発育は 25°C にて 5 日 11 20~38 mm, 10 日 11 66~79 mm, 20 日 11 73~85 mm, 30°C 10 日 11 60~80 mm; 37°C 4~15 mm, 性の特性は上記同一様、菌叢塊状培養にては小さな分生胞子形成する程度の発育を示す。本菌株は上述とは異なる菌株より屢々分離され、

61. *Penicillium purpurogenum* Stoll var. *rubri-sclerotium* Thom

Colony
attaining
days at
at 37°C,
on NO₂ or
fungus
white or pinkish, becoming brown
in non-sporulating areas with growth margin
about 20 to 30 mm wide, white or yellow shades

24 on Czapek
Strains of this species isolated from soils and forests

- Thom, C. *Mycologia* 7, 141-142, fig. 1 1915, The *Penicillia*, p. 475 1919
- Raper, K. B. C. and Fennell, D. I. *A Manual of the Fungi of the Penicillium*, 1937, 1939
- Abel, S. J. *Mycologia*, 1937, 1939

62. *Penicillium rugulosum* Thom



Fig. M-62. *Penicillium rugulosum* Thom, FAT 322, detail of a single penicillus



Fig. F-62. *Penicillium rugulosum* Thom, FAT 322, conidia showing the reticulate or verruculose walls and the asexual male form

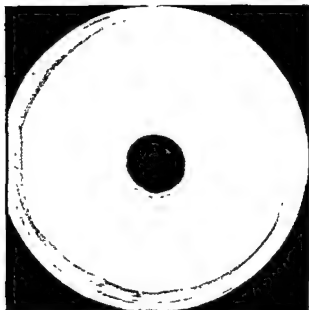


Fig C-62. *Penicillium rugulosum* Thom, FAT 322, on Czapek agar, 10 days

62. *Penicillium rugulosum* Thom

Colonies on Czapek agar growing restrictedly, attaining a diameter of 21 to 22 mm, in 10 to 12 days at 25°C (Fig C-62); 21 to 23 mm at 30°C, seldom growing at 37°C (growing very well on NO_2 medium); smooth or radial furrowed, typically velvety, with growing margin about 0.5 to 1.0 mm wide, white, compact admixture of sterile encrusted yellow or orange brown shades vegetative hyphae in central or localized areas; conidial areas in dark yellow-green shades near Dusky Yellowish Green, becoming Dusky Dull Green; exudate lacking or limitedly, brownish color; odor indistinct, reverse typical vinaceous or orange red, and orange-brown shades either in localized areas or throughout, and sometimes olive green shades in central areas, with surrounding agar colorless, becoming pale yellow shades; conidiophores arising from the basal felt, sometimes branched, mostly 120 to 190 μ by 23 to 30 μ , with apices somewhat enlarged up to 34 to 44 μ in diameter, with smooth or nearly so walled; penicilli biverticillate and symmetrical (Fig M-62); metulae loosely compact or somewhat divergent, 4 to 7 in the verticil, commonly 93 to 123 μ by 21 to 28 μ , apices about 25 to 28 μ ; sterigmata closely parallel, in clusters of 4 to 5, 81 to 112 μ by 1.8 to 2.4 μ , acuminate, conidia elliptical or ovate, mostly 2.5 to 3.7 μ by 1.8 to 2.8 μ , with echinulate or verruculose walled, and the similar walls are shown by electron microscopy (Fig E-62), conidial chains loosely tangled or divergent, up to 60 to 90 μ in length.

Colonies on steep agar growing about 23 to 27 mm in 10 to 12 days at 25°C, 21 to 22 mm at 30°C, seldom growing at 37°C, the other characters similar as on Czapek

Strains of this species isolated from soils

*Thom, C. U S Dept Agr, Bur Anim Ind Bul 118, pp 60-61 fig 21 1910 The Penicillia, pp 472-474 figs 80 and 81 1930

**Raper, J. B. Thom C and Fennell D I, A Manual of the Penicillia, pp 616-650 1949

***Abe, S J Gen Appl Microbiology 126 127 1956

ノアヘック大入培養に於ける集落の発育は25°Cにて5日目6~11 mm, 10日目21~22 mm, (Fig C-62), 20日目40~42 mm, 30°C, 10日目21~23 mm, 37°C発育不能, 集落は平滑又は放射状の縁を有し, 菌糸はピロート状, 集落内周部は白色, 0.5~1.0 mm, 巾, 中心部又は部分的に黄色又は橙褐色調の菌糸が緻密に密着す, 分生胞子着生部は暗黄緑色調; 渗出物は又は僅小, 粉色調, 集落表面は部分的に又は全面, 橙褐色, 橙赤, 橙褐色調, 又時には中心部オリーブ緑色を呈す, 集落周辺又は無色, 順次黄褐色調; 分生胞子柄は基底菌糸部より生じ, 時には分枝す, 120~190 μ ×23~30 μ , 頂端部は幾分か膨大し, 34~44 μ , 滑面, ヘニシラスは整齊輪生状 (Fig M-62) 基底枝は松葉状に或は幾分か散開状に4~7ヶ群生し, 93~123 μ ×21~28 μ , 頂端部は25~28 μ ; 梗は並行状に4~5ヶ群生, 81~112 μ ×1.8~2.4 μ , 先端が尖っている, 分生胞子は楕円又は卵形, 2.5~3.7 μ ×1.8~2.8 μ , 大細胞又は細胞粗面, 又電子顕微鏡写真 (Fig E-62) にも同様に, 分生胞子連鎖は粒状又は散開状, 長さ60~90 μ

スティープ大入培養に於ける集落の発育は25°Cにて5日目7~12 mm, 10日目23~27 mm, 20日目40~43 mm, 30°C 10日目21~23 mm, 37°C発育不能, 他の諸特性は上記同一様, 斜面大入培養にてはノアヘック大入同様発育良好

本菌は1環より分離さる



63. *Penicillium concavo-rugulosum* Abe.



Fig. 31-63. *Penicillium concavo-rugulosum* Abe, FAT 672, detail of penicilli.



Fig. 32-63. *Penicillium concavo-rugulosum* Abe, FAT 672, spores showing the slightly rough warts and the long elliptical form.

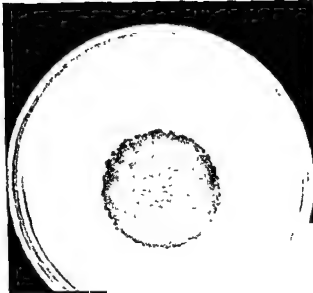


Fig C-63. *Penicillium concavo-rugulosum* Abe, FAT 744, on Czapek agar, 10 days.

63. *Penicillium concavo-rugulosum* Abe.

Colonies on Czapek agar growing rather restrictively, attaining a diameter of 27 to 37 mm in 10 to 12 days at 25°C; (Fig C-63) 27 to 38 mm at 30°C; seldom growing at 37°C; (growing very well on NO_2 -medium); consisting of a comparatively thin basal felt bearing crowded conidial structures, usually typically velvety, sometimes with yellow encrusted vegetative hyphae, a pale yellow margin 0.5 to 1.3 mm wide, conidial areas in bright yellow green or dark yellow green shades near Lincoln Green, Pois Green, Cedar Green, Empire Green, becoming dull yellow green shades near Andover Green or Tea Green, exudate lacking or limited, light orange, odor almost lacking or indistinct, moldy; reverse in orange, orange-red or orange-brown, either localized or throughout, with surrounding agar seldom pigmented in about 3 weeks; conidiophores arising primarily from the substratum or basal felt, mostly up to 50 to 250 μ or 320 μ by 25 to 38 μ , with walls smooth or nearly so, apices to 31 to 50 μ in diameter; penicilli typically biverticillate and symmetrical, (Fig M-63) usually consisting of single verticils of 4 to 8 loosely compact or somewhat divergent metulae, each terminating in verticils of 4 to 6 sterigmata, metulae mostly 106 to 175 μ by 23 to 35 μ ; sterigmata closely parallel, mostly 11 to 14 μ by 18 to 27 μ , conidia typical long elliptical, mostly 11 to 4.3 μ by 21 to 30 μ , with smooth or slightly rough walled, and the slightly rough walls are shown by electron microscopy (Fig E-63), conidial chains loosely parallel or tangled, up to 60 to 250 μ in length.

Colonies on steep agar growing rather restrictively, about 30 to 42 mm in 10 to 12 days at 25°C, 30 to 43 mm at 30°C, seldom growing at 37°C, the other characters similar as on Czapek.

Strains of this species isolated from soils and diseased rice

*Abe, S. Gen Appl Microbiology, 127 123, 1956

ソアベック agar 培養に於ける集落の発育は 25°C にて 5 日目 8~16 mm, 10 日目 27~37 mm, 20 日目 52~63 mm; 30°C 10 日目 27~38 mm; 37°C 発育不能; 集落は分生胞子構成体をもった比較的薄い基礎菌糸帯を有し、常に菌糸はビロート状、時には黄色調菌糸を有し、集落周囲部は薄黄色、巾 0.5~1.3 mm; 分生胞子菌生部は鮮黄緑色又は暗黄緑色調、順次くすんだ黄緑色調を呈す; 渗出物は欠又は僅小、薄橙色; 集落表面は橙、橙赤、橙褐色調に部分的に又全面呈色、集落周辺部又は約 3 週間目にも無菌色、分生胞子は基質又は基礎菌糸帯より生育し、60~250 μ ~320 μ ×25~38 μ , 滑面、頂端部 31~50 μ ; ヘニシラスは整齊輪生状、(Fig M-63) 各々 4~6 ケの梗子を持った基底梗子は粒点状様に又幾分か散開状に 4~8 群生す; 基底梗子は 10.6~17.5 μ ×2.3~3.5 μ , 梗子は並行状に直立、11~14 μ ×1.8~2.7 μ ; 分生胞子は長楕円形、31~43 μ ×2.1~3.0 μ , 滑面又は僅小粗面、又電子顕微鏡写真 (Fig E-63) にても 0.1 μ 以下の僅小粗面、分生胞子連鎖は並行状様に、鏈状、長さ 60~250 μ

ステープル agar 培養に於ける集落の発育は 25°C にて 5 日目 10~17 mm, 10 日目 30~42 mm, 20 日目 60~70 mm; 30°C 10 日目 30~43 mm, 37°C 発育不能、他の諸特性は上記の如く、並行酸水培養にてはソアベック agar 同様良好なる発育を示す。

本菌株は 1 菌株又は病変米より分離さる

64. *Penicillium tardum* Thom



Fig. M-64A. *Penicillium tardum* Thom, FAT 923, low power view of colony section showing typically velvety character of texture.



Fig. M-64B. *Penicillium tardum* Thom, FAT 922, detail of penicilli



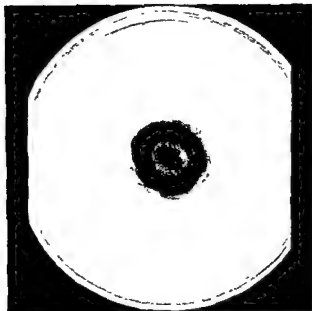


Fig C-64. *Penicillium tardum* Thom, FAT 922, on Czapek agar, 10 days

64 *Penicillium tardum* Thom

ソアヘック大人培養に於ける発育の発育は 25°C にて 5 日 11 9~11 mm, 10 日 20~35 mm, 20 日 50~65 mm, 30°C, 10 日 20~38 mm; 37°C 発育不能; 菌糸はビロード状又は類似, 生落は中心部が隆起し, 分生胞子生育生部には黄色面を豊富で, 波状の輪層状を呈す, 生落内周縁は黄色, 10~20 mm 中, 分生胞子生育生部は暗黄緑色又は灰緑色調, 分泌物は久; 生落表面は無色又は輝黄色調, 生落周辺部又は無色又は暗赤黄緑色調に着色; 分生胞子の柄は基質又は気菌糸より生育, 60~300 μ × 2.3~3.8 μ , 頂端泡, 31~49 μ , 滑面; ヘミノラスは整齊輪生状 (Fig M-64), 時々断片的, 基底梗子は散生状様又は幾分か散開状様に 5~8 ケ群生, 9.3~15.0 μ × 2.1~3.4 μ ; 梗子は並行状様に 4~8 ケ群生, 9.3~14.5 μ × 2.0~3.0 μ , 輪生状; 分生胞子は長楕円形, 2.8~4.4 μ × 1.7~2.5 μ , 滑面, 電子顕微鏡写真 (Fig E-64) にては 0.1 μ 以下の微小粗面, 分生胞子連鎖は錠状又は散開型様, 長さ 60~190 μ

スライフ大人培養に於ける発育の発育は 25°C にて 5 日 11 9~11 mm, 10 日 21~31 mm, 20 日 58~70 mm, 30°C, 10 日 24~32 mm, 37°C 発育不能, 他の諸特性は上記同様

他特性大人培養に於てはソアヘック大人同様の良好なる発育を示す

本菌は 1 菌株は腐敗物より分離する

Colonies on Czapek agar growing rather restrictively, attaining a diameter of 20 to 35 mm. in 10 to 12 days at 25°C, 20 to 38 mm at 30°C, seldom growing at 37°C, (growing very well on NO_2 medium), velvety or velutinous, usually elevated central areas, yellow mycelium abundantly in non sporulating areas and wave-zonated, with yellow margin about 10 to 20 mm wide (Fig C-64); conidial areas in dark yellow green or gray green shades near Tea Green, Andover Green, Dusky Yellowish Green, Javal Green, exudate lacking, odor limited or indistinct; reverse colorless or bright yellow shades, with surrounding agar colorless or becoming pale yellow shades pigmented, conidiophores arising either from the substratum or from aerial hyphae, variable in length, commonly 60 to 300 μ by 2.3 to 3.8 μ , with apices somewhat enlarged up to 31 to 49 μ , with smooth or nearly so walled, penicilli typically biverticillate symmetrical but often fractional (Fig M-64); metulae in verticils of 5 to 8, loosely compact or some what divergent, mostly 9.3 to 15.0 μ by 2.1 to 3.4 μ , sterigmata closely parallel, in clusters of 4 to 6 or 8, mostly 9.3 to 14.5 μ by 2.0 to 3.0 μ , lanceolate, conidia long elliptical, mostly 2.8 to 4.4 μ by 1.7 to 2.5 μ , with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-64), conidial chains loosely tangled or divergent up to 60 to 190 μ in length

Colonies on steep agar growing rather restrictively, about 21 to 31 mm in 10 to 12 days at 25°C, about 24 to 32 mm at 30 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek

Strains of this species isolated from soils and decomposing materials

* Thoen C. The Penicillia pp. 485-487, fig. 85 1939

* Meyer K. B. Thoen C. and Jennell, D. I. A Manual of the Penicillia pp. 651-653 1949

** Allen J. Gen. Appl. Microbiology 125-129 1976

65. *Penicillium diversum* Raper and Fennell

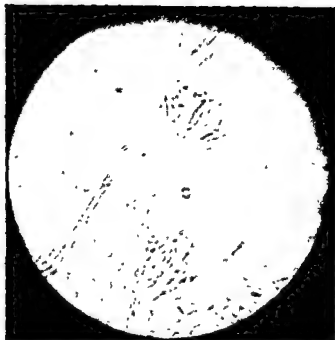


Fig. M-65A. *Penicillium diversum* Raper and Fennell, FAT 1291, detail of the penicilli.



Fig. M-65B. *Penicillium diversum* var. *aureum* Raper and Fennell, FAT 1295, detail of a single penicillus.

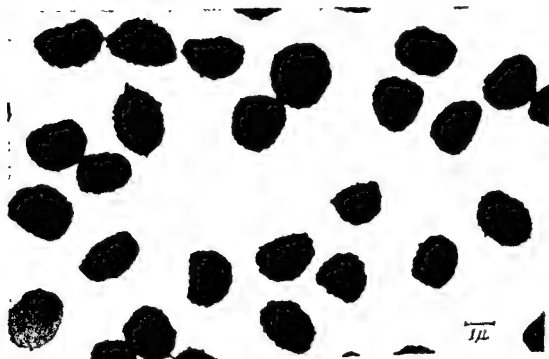


Fig. L-67. *Penicillium diversum* Raper and Fennell, FAT 1291, conidia showing the slightly rough walls and the elliptical or subglobose form.

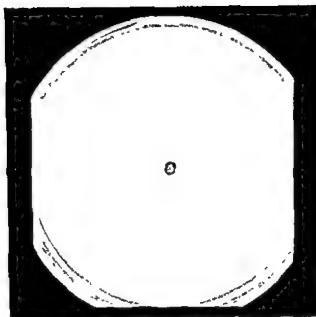


Fig. C-65. *Penicillium diversum* Raper and Fennell, FAT 1394, 10 days

ソアベック寒天培養に於ける集落の発育は特長的に遅く、25°C、5日目約3mm、10日目約4mm、20日目約5mm; 30°C 10日目約3mm; 37°C 発育不能; 集落は硬い菌糸帯を有し、菌糸はビロード状、作小な顆粒状、集落周囲部は白色、約0.2mm巾、Y-帯 (Fig. C-65); 分生胞子着生部は黄緑色、又は暗オリーブ緑色調; 滲出物は欠; 集落表面は無色; 分生胞子柄は菌糸帯より生育し、120~200 μ ×25~34 μ 、頂端部30~45 μ 、滑面、ヘミシラスは整齊輪生状 (Fig. M-65)、基底梗子は紐状様には幾分か散開状に5~7ヶ群生し、75~125 μ ×21~31 μ 、梗子は並行状様に5~6ヶ着生、87~10 μ ×15~22 μ 、槍針状; 分生胞子は楕円又は垂球形、18~26 μ ×15~19 μ 、滑面、又電子顕微鏡写真 (Fig. E-65) にては0.1 μ 以下の作小粗面、分生胞子連鎖は鏈状、長さ、70~120 μ

ステイブ寒天培養に於ける集落の発育はノアベック寒天同様に、25°C 5日目約3mm、10日目約5mm、20日目約6mm、30°C、約4mm、37°C 発育不能、他の諸特性は上記同一様。

硝酸素寒天培養にてはノアベック寒天同様の発育を示す。

本菌種は土壌より分離さる。

65 *Penicillium diversum* Raper and Fennell

Colonies on Czapek agar growing extremely slow-growing, about 4 mm in 10 to 12 days at 25°C; about 3 mm at 30°C; seldom growing at 37°C, (growing very well on NO₂-medium), consisting of a fairly tough mycelial felt, surface appearing velvety or slightly granular, with white margin about 0.2 mm. wide, smooth, conidial areas in yellow green shades near Dark Greenish Olive, becoming Dark Ivy Green, exudate lacking; odor suggesting sea-weed; reverse uncolored (Fig. C-65), conidiophores arising from the mycelial felt, up to 120 to 200 μ by 2.5 to 34 μ , with apices somewhat enlarged to 30 to 45 μ , with smooth or nearly so walled, penicilli typically biverticillate and symmetrical (Fig. M-65); metulae loosely compact or somewhat divergent, in verticils 5 to 7, mostly 75 to 125 μ by 21 to 31 μ , sterigmata closely parallel, in clusters of 5 to 6, mostly 87 to 10 μ by 15 to 22 μ , lanceolate; conidia elliptical or subglobose, mostly 18 to 26 μ by 15 to 19 μ with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig. E-65), conidial chains tangled, up to 70 to 120 μ in length

Colonies on steep agar growing very restrictedly, about 5 mm in 10 to 12 days at 25°C, about 4 mm at 30°C; seldom growing at 37°C, the other characters as on Czapek.

Strains of this species isolated from soils

*Raper, A. B. and Fennell, D. I., Mycologia, 40: 535-541, fig. 11, 1948

**Raper, K. B., Thom, C. and Fennell, D. I., A Manual of the Penicillia, pp. 653-655, 1949.

66. *Penicillium herquei* Bainier and Sartory



Fig. M-66A. *Penicillium herquei* Bainier and Sartory, FAT 958, low power view of colony section showing typically velvety character of texture



Fig. M-66B. *Penicillium herquei* Bainier and Sartory, FAT 958, detail of penicilli

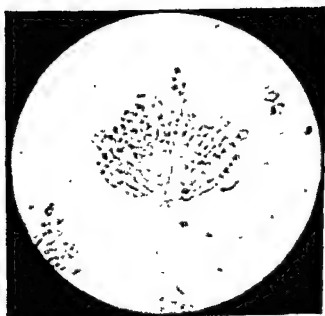


Fig. M-66C. *Penicillium herquei* Bainier and Sartory, FAT 958, detail of a single penicillus



Fig. M-66D. *Penicillium herquei* Bainier and Sartory, FAT 958, conidia showing the slightly rough walls and the long apical or vagly ball-like form



ig. C-66. *Penicillium herquei* Bainier and Sartory, FAT 958, 10 days

ノアベックム入培養に於ける発生の発白は 25°C にて 5 日 11 8~13 mm, 10 日 11 17~43 mm, 20 日 11 28~64 mm; 30°C 10 日 11 17~43 mm; 37°C 発育不能; 菌糸はピロート状又は類似, 又或る菌株にははげしい又は明確な綿毛状, 平滑又は放射状縁線をもつ。分生胞子母菌生部にては黄色面を呈し, 乳落周囲は黄色, 巾 0.2~2.0 mm (Fig. C-66) 分生胞子母菌生部は鮮黄緑色又は暗黄緑色調, 順次同一色調又はくすんだ暗緑色調を呈す, 分泌物は欠又は僅小, 黄緑色; 乳落表面は部分的に又は全面に鮮緑色, 黄緑色, 又はナリーブ褐色調, 乳落周辺皮人は薄緑色, ナリーブ褐色, 又はくすんだ黄色調; 分生胞子柄は菌糸帯より又は基質より生じ, 60~280 μ \times 2.5~5.3 μ , 頂端部は 3.1~6.7 μ , 顆粒状又は斑状状曲; ヘニラスは比較的短く, 常に梗子を着生する基底梗子の群生をなす (Fig. M-66); 基底梗子は散開型に 4~10 μ 群生, 7.5~15.6 μ \times 2.3~5.0 μ ; 頂端部は 3.1~6.0 μ , 梗子は線索状群に又幾分か散開状に 3~9 μ 群生, 8.7~14.4 μ \times 1.8~4.0 μ 最も細い明後, 急激に細い, 分生胞子は長楕円又はラプビーナール形 2.8~4.4 μ \times 1.8~3.0 μ , 平滑, 電子顕微鏡写真 (Fig. E-66) にても 0.1 μ 以下の微小相面, 分生胞子連鎖は粒状又は平行状群, 長さ 30~160 μ .

ステイブム入培養にては 25°C 5 日 11 10~25 mm 10 日 11 22~60 mm 20 日 11 38~74 mm, 30°C 10 日 11 24~60 mm, 37°C 発育不能, 他の諸特性は上記同様。

赤崎峰入培養にてはノアベックム入同様; 発白良好。

本菌株は 1 頃又は顕微鏡より分離する

66 *Penicillium herquei* Bainier and Sartory

Colonies on Czapek agar growing rather restrictedly, attaining a diameter of 17 to 43 mm. in 10 to 12 days at 25°C; 17 to 43 mm at 30°C; seldom growing at 37°C, (growing very well on NO_2 medium); velvety or velutinous, some strains subfloccose or floccose, smooth or loosely radial furrowed, yellowish mycelium abundantly in sterile areas, with typical yellowish margin about 0.2 to 2.0 mm wide (Fig. C-66), conidial areas bright to dark yellow green shades near Crass Green, Kronberg's Green Dusky Olive Green, France Green, Dusky Yellowish Green, becoming similar shades or Andover Green, exudate lacking or limited, yellow green color, odor sometimes lacking or indefinite but usually strong, variable, often suggesting black walnuts, occasionally apples, or in some strains spicy, reverse in bright green, blackish green or olive brown colors in localized or throughout, with surrounding agar pale green, olivish brown or dull yellow shades, conidiophores arising from the felt or directly from the substratum, commonly 60 to 280 μ by 2.5 to 5.3 μ , with apices somewhat enlarged up to 3.1 to 6.7 μ , with granular or punctate walled; penicilli comparatively short, regularly consisting of a terminal vertical of metulae bearing clusters of sterigmata (Fig. M-66), metulae usually in verticils of 4 to 10, suggestive divaricate, commonly 7.5 to 15.6 μ by 2.3 to 5.0 μ , apices 3.1 to 6.0 μ , sterigmata loosely compact or somewhat divergent, in clusters of 3 to 9, commonly 8.7 to 14.4 μ by 1.8 to 4.0 μ , tapered abruptly to narrow beak-like conidial tubes; conidia long elliptical or Ragby ball form, mostly 2.8 to 4.4 μ by 1.8 to 3.0 μ , with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig. E-66), conidial chains tangled or loosely parallel, up to 30 to 160 μ in length.

Colonies on steep agar growing more rapidly, 22 to 60 mm. in 10 to 12 days at 25°C, 24 to 60 mm at 30°C, seldom growing at 37°C, the other characters similar as on Czapek.

Strains of this species isolated from soils and deteriorating materials.

*Bainier G. and Sartory A. Bul. Soc. Mycol. France 24 123 126 Pl. VII figs. 1 10 1912

**Thom C. The Penicillia pp. 467 469 fig. 78 1930

***Raper K. B. Thom C. and Fennell D. I. A Manual of the Penicillia pp. 65 664 1943

****Abe J. J. Gen. Appl. Microbiology 129 130 1956

67. *Penicillium novae-zeelandiae* van Beyma

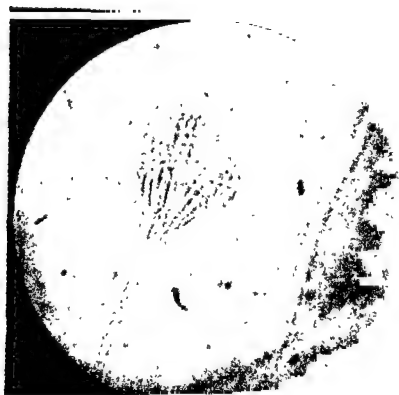


Fig. M-67. *Penicillium noronae acelandiae* van Heyna, FAT 1296, detail of a single penicillus

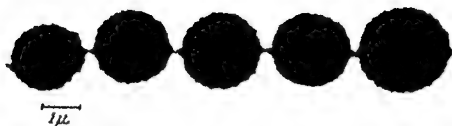


Fig. E-67. *Penicillium noronae acelandiae* van Heyna, FAT 1296, spores showing the slightly rough walls and the glabrous or subglabrous form

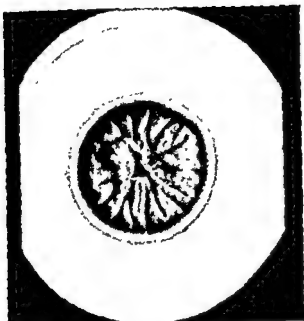


Fig C-67. *Penicillium novae-zelandiae* van Beyma, FAT 1296, on Czapek agar, 10 days.

ノアヘック寒天培養に於ける生落の発育は 25°C にて 5 日目約 20 mm, 10 日目約 35 mm, 20 日目約 70 mm; 30°C 10 日目約 36 mm, 37°C 発育不能。菌落ブロード状、放射状様の菌を有し、生落円形または白色、約 1.5 mm 巾; 分生胞子着生部はくすんだ緑色、又は灰緑色調、時々灰オリーブ色調を呈す; 分泌物は久又は僅小、黄褐色調; 生落表面中心部は暗緑色又は暗色調、円周部近くは黄色、緑、桃色調; 生落周辺部入はくすんだ黄又は桃色調 (Fig C-67), 或る菌株にては中心部に灰色菌核を数個に作り、又時々、僅少の菌糸に包まれた菌核がセクター (扇状) 部に又は不規則な部分に出来る、菌核の形は不均一で、長楕円又は輪形で、基質の表面に発育し放射状線に沿って長軸を位置している; 分生胞子柄は基質又は基礎菌糸帯より生ずり、60~240 μ \times 30~38 μ , 基端部 35~43 μ , 顆粒状粗面; ヘニラスは整齊輪生状 (Fig M-67), 芽胞梗子は鎖状排列に又は散開状に 4~6 ヶ群生し、10~119 μ \times 28~37 μ , 梗子は鎖状排列に 3~6 ヶ群生し、10~112 μ \times 17~25 μ 筒状、分生胞子は球形又は亜球形、18~26 μ , 表面、丸山/顆粒状 (Fig E-67) いては 0.1 μ 以下の微小粗面、分生胞子座頭は散開状又は並び状、長さ 10~40 μ

ステープル寒天培養に於ける生落の発育は 5 日目約 27 mm, 10 日目約 52 mm, 20 日目約 75 mm, 30°C 10 日目約 51 mm, 37°C 発育不能、他の諸性質は同一様。

筆頭菌人培養 是はノアヘック寒天培養の発育を小丁。

本菌種は土壌より分離さる

67. *Penicillium novae-zelandiae* van Beyma

Colonies on Czapek agar strictly, attaining a diameter of 10 to 12 days at 25°C, about 35 mm seldom growing at 37°C; (growing on NO₂ medium); velutinous, loosely radiating with white margin about 15 mm wide; areas in dull green shades near Andover Green or Pea Green, becoming Grayish Olive, exudate lacking or limited, clear; odor lacking, reverse in dark greenish to black shades in central areas and dull to fairly bright yellow, orange or pink shades in marginal areas; with surrounding agar dull yellow or pinkish shades (Fig C-67), some strains producing abundant black sclerotia in central areas, occasionally showing sectors or irregular areas with abundant sclerotia accompanied by a reduced or limited mycelial development, sclerotia very irregular in form, usually elongate or elliptical, often confluent, with long axes oriented along radial lines usually developing in the surface of the substratum, conidiophores arising from the substratum or basal felt, mostly 60 to 240 μ by 30 to 38 μ , with apices somewhat enlarged up to 35 to 43 μ , with granular walled; penicilli symmetrical and biverticillate (Fig M-67), metulae loosely compact or divergent, 4 to 6 in the vertical, mostly 10 to 119 μ by 28 to 37 μ , sterigmata loosely compact, in clusters of 3 to 6, mostly 10 to 112 μ by 17 to 25 μ , lanceolate-like conidia globose or subglobose, mostly 18 to 26 μ , with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-67), conidial chains divergent or loosely parallel, up to 10 to 40 μ or more in length

Colonies on steep agar growing rather rapidly, about 52 mm in 10 to 12 days at 25°C, about 51 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek

Strains of this species isolated from soils.

*van Beyma F H Antonie van Leeuwenhoek 6, 273 275, fig 7 1939 1942

**Raper, K. B. Thoma and Fennell D I A Manual of the pp 165 66 1949



Fig. M-67. *Penicillium norvegeae* van Beyma, FAT 1296, detail of a single penicillus



Fig. E-67. *Penicillium norvegeae* van Beyma, FAT 1296, conidia showing the slightly rough walls and the glabrous or subglabrous form

68. *Penicillium albicans* Bainier

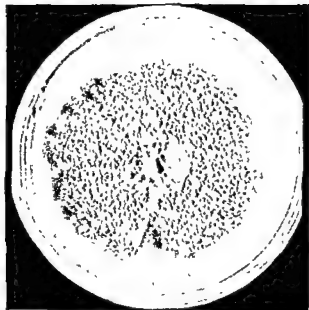


Fig. C-68. *Penicillium albicans* Bainier, FAT 1316, on Steep agar, 10 days

ノベック寒天培養に於ける実落の発育は 25°C にて 5 日目約 15 mm; 10 日目約 40 mm, 20 日目約 55 mm; 30°C 日目約 30 mm, 37°C 発育不能; 粗雑なる発育を示し、大変厚く、実落菌糸は僅小で且つ殆んどが基底菌糸のみで、無色、僅小なる分生胞子の発育を示すに過ぎぬ。

スチープ寒天培養に於ける実落の発育は良好にて、25°C 5 日目約 20 mm, 10 日目約 63 mm (Fig. C-68), 20 日目約 75 mm, 30°C 10 日目約 35 mm; 37°C 発育不能; 菌糸は僅小な種状、実落平滑又は放射状の皺を有す、実落円周部は白色、約 3 mm 巾、分生胞子着生は豊富、分生胞子着生部は最初白色から薄クリーム色、順次同様色調又は薄緑色調; 滲出物は欠。実落裏面は薄緑色乃至褐色調、実落周辺寒天は無色; 分生胞子柄は気菌糸又はロープ状菌糸より生育し、20~60~100 μ \times 30~53 μ , 頂端部は 37~63 μ , 滑面、ヘニラスはサイズ及様相が各種で、梗子の下部は 3~4 回分枝するか、整齊状で、各微細構成部は枝状様に密接した形状を示す。分枝は各種サイズを示し、7.5~25 μ \times 28~50 μ , 頂端部は 30~56 μ , 芽胞梗子は樹皮状に 3~5 ケ群し、7.5~187 μ \times 24~35 μ , 梗子は樹皮状に 3~5 ケ着生し、7.5~12.5 又は 18 μ \times 21~30 μ , 先端部は幾分か細い; 分生胞子は両端部が幾分か平たい楕円形、46~93 μ \times 21~37 μ , 滑面、電子顕微鏡写真 (Fig. E-68) にても滑面、分生胞子連鎖は散開状で、長さ 30~120 μ

亜硝酸寒天培養にては発育不能、

本菌は土壌又は変質産物より分離さる。

68. *Penicillium albicans* Bainier

Colonies on Czapek agar growing somewhat broadly, attaining a diameter of about 40 mm in 10 to 12 days at 25°C, about 30 mm at 30°C, seldom growing at 37°C; (growing little or not on NO₂ medium); but growing very sparsely, very wholly with vegetative mycelium limited and almost submerged, uncolor, lightly sporulating throughout

Colonies on steep agar fairly luxuriant, attaining a diameter of about 63 mm. in 10 to 12 days at 25°C, about 35 mm at 30°C; seldom growing at 37°C, slightly funiculose, smooth or radial furrowed, with white margin about 3 mm. wide heavily sporing throughout, conidial areas at first white to light cream, becoming light buff or pale pinkish shades, odor lacking; exudate not produced, reverse in deep tan to light brown shades, with surrounding agar colorless, conidiophores arising from aerial hyphae and ropes of hyphae, variable in length, mostly 20 to 60 or 100 μ by 30 to 53 μ , with apices somewhat enlarged up to 37 to 63 μ , with smooth or nearly so walled; penicilli variable in size and pattern, commonly very large and 3 or 4 times branched below the sterigmata, often but not consistently symmetrical, with cellular elements closely appressed to form a very compact fruiting head (Fig. M-68). branches variable in form and size, mostly 75 to 25 μ by 28 to 50 μ , with apices about 30 to 56 μ , metulae closely compact, 3 to 5 in the verticil, mostly 75 to 187 μ by 24 to 35 μ , sterigmata closely compact, in clusters of 3 to 5, mostly 7.5 to 125 or 18 μ by 21 to 30 μ with conidium bearing tips somewhat narrowed, conidia strongly elliptical with basal ends somewhat flattened, 46 to 93 μ by 21 to 37 μ , with smooth or nearly so walled, and the smooth or nearly so walls are shown by electron microscopy (Fig. E-68), conidial chains loosely divergent, up to 30 to 120 in length

Strains of this species isolated from soils and filter paper

*Bainier, G., Bul. Soc. Myc. France 23, 18, p. 1 v. figs. 8 and 9 1907

**Thom C. The Penicillia, p. 495 fig. 87 1939

***Raper, A. B., Thom, C. and Fennell D. I., A Manual of the Penicillia, pp. 669 672 1919

****Tubaki, K. Nagô 4 p. 23 1954

*****Abe, S., J. Gen. Appl. Microbiology 133 1956



Fig. M-68. *Penicillium albicans* Bainier, FAT 1316, detail of penicilli



Fig. F-68. *Pyrenopeziza* Bainier, FAT 1316, spores showing the smooth or nearly so walls and the strength of apical walls. Basal ends somewhat flattened.

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